The Journal of
NERVOUS and MENTAL DISEASE

VOL. 133, NO. 2
August, 1961
SERIAL NO. 945

THE PATHOLOGIC SPECTRUM OF HUNTINGTON'S CHOREA

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Although the literature over the last 50 years contains many accounts of the pathology of Huntington's chorea (chronic progressive chorea), a considerable amount of uncertainty remains as to the character and significance of some of the changes described.

The lesion which has attracted most attention is that affecting the striatum (caudate nucleus and putamen). Following the early observations of Alzheimer (1), this structure has consistently been found to show severe degeneration, characterized grossly by marked shrinkage of its substance, and histologically by loss of nerve cells and conspicuous astrocytosis (6, 12, 17). Although it seems clear that the changes are diffuse, it has been observed occasionally that they are not uniform in all parts of the striatum (6, 9, 17). Several reports have emphasized that the small ganglion cells of the striatum are selectively involved, the large cells being well preserved (4, 8, 9); others, however, have made a less definite distinction, or have not commented on the subject.

Atrophy of the gyri has been a constant companion of the striatal lesion, and in many cases has been pronounced. Occasional instances have been recorded, however, in which this feature appeared to be inconspicuous or absent (12, 17). In the cerebral cortex, such changes as neuronal degeneration and depletion, gliosis and atrophy have been stressed with varying emphasis by many authors (1, 6, 12, 14, 17, 18), but assessments of the essential character of the process and its distribution have shown much less uniformity than those relating to the striatum, and have provided no definite indication as to whether it is in any way specific to the disease. According to one of the few writers to comment on the subject recently (10), the changes amount to a general reduction in neuronal population in layers 3, 5 and 6, with inconspicuous changes in some of the neurons which survive, and with little glial reaction.

Most debatable is the extent to which other parts of the nervous system are involved. Although several observers have found few abnormalities of note, aside from some shrinkage of the pallidum (12, 17), the majority have found varying amounts of disturbance at one or more of a considerable number of sites, which include the thalamus and subthalamic areas (1, 11, 14) and the dentate nucleus of the cerebellum (7, 11, 18). In the largest collection of material to be described—the 17 cases reported by Dunlap (6)—these areas were incompletely studied. In one case, however, cerebellar atrophy was marked, and in one or two cases a generalized neuroglial reaction had occurred in the red nucleus. A recent comment on the subject (19) was that there are some cases with injury of the

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pallidum, and even some where the lesions overflow onto the corpus luysi, the thalamus and the dentate nucleus.

PRESENT STUDY

The present study is based on the pathologic material from 21 persons with Huntington's chorea, all of whom died in the Rochester State Hospital during the period 1937 through 1960. Complete necropsy had been carried out in all except two, whose spinal cords were not examined. At necropsy a variable number of blocks had been taken from the nervous system for histologic study and the residual gross material stored in formalin. In the present study this gross material was re-examined and the necessary additional blocks were taken for microscopy. The older blocks and sections were also available. All tissues were embedded in paraffin. The minimal number of representative sections examined from the main areas or levels of the nervous system in any case was as follows: cerebral cortex, 12; basal ganglia, six; subthalamic region, two; midbrain, one; pons, two; medulla, two; spinal cord, three. The quality of the sections stained with hematoxylin and eosin and cresyl violet, and made from the blocks taken from the older formalin-stored gross material, was nearly always sufficiently good for accurate study. The original paraffin blocks permitted good phosphotungstic acid-hematoxylin, Holzer, luxol-fast blue and cresyl violet, and Weil's myelin preparations to be made from the necessary areas in almost every case where they were not already available. Reasonable Cajal gold-impregnation preparations were obtained after rejuvenation from some of the more recent formalin-stored material.

CLINICAL DATA

In all 21 cases there was good evidence of the heredofamilial character of the disease. The ages of the patients at the time of death ranged from 36 to 77 years, four being in the fourth decade, one in the fifth, eight in the sixth, seven in the seventh, and one in the eighth. Fifteen were males; six, females; among the latter were the mothers of two of the affected males. The duration of the clinical disorder was from seven to 26 years, the average being 16 years. Several patients had died from some other cause before the malady had run its full course.

The clinical manifestations of the disease in every case appeared to fall within the recognized spectrum of Huntington's chorea. For the most part, mental disorder was the initial incident, but in a few cases this appeared to have been preceded by involuntary movements, or such symptoms as difficulty with swallowing or speech. Both mental and motor disturbances had invariably been present for some time prior to death, and were usually pronounced in the later stages of the disease. Many of the patients had been emaciated and bedridden for some time. One patient, whose family pedigree has been described by Pearson and Petersen (13), had the classic manifestations of von Recklinghausen's disease.

GENERAL PATHOLOGIC FINDINGS

Bronchopneumonia was the most common immediate cause of death, and sometimes was accompanied by such other forms of sepsis as pyelonephritis. In two cases, however, death was caused by pulmonary embolism, and in three others by myocardial infarction, obstruction of larynx by a bolus of food, and injury to the head, respectively. A variety of minor lesions were found in the various viscera, but the incidence and character of these did not appear to differ significantly from those found at routine necropsies. Anatomic malformations were noted in only two cases: in one, slight coarctation of the aorta and duplication of the right renal pelvis were present; in the other, there was an anterior renal pelvis. As has already been mentioned, there was also one case with von Recklinghausen's disease. The liver, spleen and heart were often somewhat atrophic when emaciation of the body was

FIG. 1. Marked convolutional atrophy in frontal and temporoparietal areas, with slight thickening of the meninges.

evident. Microscopically, the liver cells often showed mild atrophy with excess lipochrome, but there was no fibrosis or loss of architecture. The histologic findings in the kidneys, spleen, heart, pituitary, adrenal glands and gonads were not noteworthy.

GROSS APPEARANCE OF THE BRAIN AND SPINAL CORD

In 13 of the 21 cases the cerebral convolutions showed moderate or advanced symmetric atrophy (Figure 1), accompanied frequently by an obvious overall shrinkage and a reduction in the weight of the brain to 150 gm. or more below the weight expected in normal persons of the same age and sex. In the remaining eight cases, only mild or inconspicuous convolutional atrophy was apparent. The atrophy in the most severely affected cases involved the gyri in all parts of the cortex and appeared to be virtually uniform, save at the occipital poles, where it was usually less marked. In the milder cases it was as a rule more prominent at the frontal poles than elsewhere. Some opacity and patchy thickening of the meninges were present in many cases. Overall, the character of the gyral atrophy and meningeal fibrosis occurring in the entire group was remarkably similar to that seen in simple senile atrophy of the hemispheres.

Sectioning of the brain revealed generalized and symmetric dilatation of the lateral ventricles in 16 cases. In half of these the dilatation was pronounced and was associated with considerable narrowing of the centrum semiovale and thinning of the corpus callosum. Definite shrinkage of the striatum was apparent in all but one. Although it tended to be rather more obvious in the caudate nucleus than in the putamen, the atrophy appeared to involve each structure uniformly. In the majority, the shrinkage was severe (Figure 2): the head of the caudate nucleus was less than half the normal thickness, and in some instances was as little as 3 mm. in maximal width. Often the

FIG. 2. Marked striatal atrophy, with conspicuous dilatation of the lateral ventricles.

tail was reduced to an inconspicuous ribbon. In four cases, however, atrophy was mild, and the striatum appeared to possess at least three-quarters of its normal bulk. Slight wasting of the globus pallidus was sometimes noted, and occasionally both it and the striatum were a rusty brown. The thalamus and subthalamic area appeared to be unremarkable except for slight, uniform atrophy of the thalamus in two cases. Occasionally there was slight dilatation of the third ventricle. The midbrain, brain stem and spinal cord were usually unremarkable, save for probable slight narrowing in a number of cases. In two cases, however, considerable atrophy of the basilar part of the pons was observed, accompanied in one by definite narrowing of the middle cerebellar peduncles. In no instance was any loss of substance apparent in the cerebellum. In the one case of associated von Recklinghausen's disease there were numerous neurofibromas on the spinal nerve roots.

In most cases, atherosclerosis of the main cerebral arteries was inconspicuous, and in no instance was it severe.

Incidental lesions found in the skull and brain of individual subjects were: small subdural hematomas in two cases; subdural abscess in one; multiple small infarcts of embolic origin in one; a small infarct in the basal ganglia in one; acute otitis media and frontal sinusitis in one; hyperostosis of the frontal bone in one; hyperostosis of the occipital bone in one, and bilateral incisions for prefrontal lobotomy in two.

MICROSCOPIC DESCRIPTION

Meninges: The leptomeninges frequently showed mild fibrous thickening, accompanied at times by focal hyperplasia of the arachnoid lining cells. Aside from the reaction to several of the gross lesions mentioned, the only inflammatory cells present were occasional mononuclear leukocytes and siderophages.

Cerebral Cortex: The amount of involvement varied widely, ranging from only

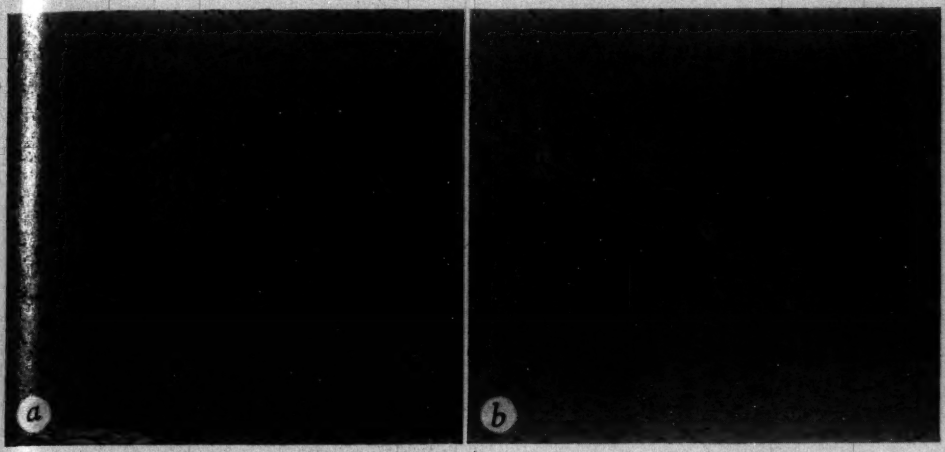

FIG. 3. Frontal cortex. *a:* Focal loss of nerve cells in layers 3, 5 and 6 (cresyl violet; reduced from ×30). *b:* Marked neuronal depletion, especially in layers 3 and 5 (cresyl violet; reduced from ×40).

minor abnormality in six case to considerable cortical atrophy in three. The changes were diffuse and in general appeared to be of similar overall intensity in the frontal, temporal and parietal cortices, and somewhat less severe in the occipital region. Layers 3, 5 and 6 always showed the most obvious changes and were usually affected in similar degree. In milder cases, loss of nerve cells occurred in small irregular foci (Figure 3*a*), and in the more severely involved, larger denuded patches (Figure 3*b*) or at times diffuse depletion was observed. Moderate narrowing of the affected laminae was sometimes seen. Layer 4 not infrequently showed patchy involvement. The depopulation of the cortex had no particular relationship to any part of the gyri or to the blood vessels. In many cases the residual nerve cells in layers 3, 5 and 6 were considerably shrunken and deeply basophilic, while their cytoplasm sometimes contained prominent accumulations of lipochrome. In general, however, their polarity was not significantly disturbed. In the motor cortex Betz's cells sometimes appeared to be less reduced in number than the other cells in layer 5, although they often showed marked lipochromic pigmentation and, in some cases, moderate shrinkage and hyperchromasia. In a few cases there was slight thickening or accentuation of the subpial fibrillary network, but the molecular layer was usually well preserved, as was layer 2.

For the most part, reactive changes were not conspicuous. Mild astrocytosis was noted frequently in layers 5 and 6, and often the nuclei of the astrocytes showed slight to moderate swelling and were more vesicular than is normal. Slight fiber production was observed sometimes. In a few cases, astrocytosis was moderately prominent, and layer 3 was affected also. Astrocytic proliferation did not correlate closely with the loss of nerve cells, and in two cases in particular it was virtually absent, though the other changes were prominent. Mild to moderate thickening of the walls of arterioles was associated with cortical atrophy, but otherwise the vasculature appeared to be unaffected.

Because of the nature of the material, no attempt was made to study in detail the incidence of senile plaques and neurofibril-

lary change. However, no lesions of this type were seen in the ten cases where satisfactory Bodian's preparations were available from some part of the prefrontal cortex. In sections stained by this method and for myelin, there was never evidence of more than slight loss of cortical nerve fibers.

Comparison of hematoxylin- and eosin-stained sections of cortex in the cases of chorea with sections taken from the same areas of 30 brains showing simple senile cerebral atrophy disclosed no essential difference in the qualitative changes in the two groups. Loss of nerve cells and glial reaction in particular seemed to follow an identical pattern. In addition, when the same degree of atrophy was present grossly in cases from the two groups, the microscopic changes were quantitatively similar.

Hippocampus and Hippocampal Gyrus: The hippocampus in some cases showed marked shrinkage of the cells in the pyramidal band, and mild astrocytosis in Rose's field H5. In a few, a slight, diffuse loss of nerve cells was apparent. In the great majority, changes were less conspicuous than in the cortex elsewhere. The subicular region and adjacent areas of the cortex often showed changes similar to those observed in other parts of the cerebral cortex.

Centrum Semiovale: In cases where cerebral atrophy was pronounced, slight to moderate crowding of the interfascicular oligodendrocytes and mild focal or diffuse astrocytosis were usually noted. No evidence of demyelination was present in luxol-fast blue preparations. Some widening of the perivascular spaces was common, and was accompanied at times by rarefaction of the immediately adjacent brain tissue and accumulation of small numbers of siderophages in the perivascular spaces. There was no other cellular infiltration. The arterioles frequently showed moderate sclerotic changes.

Striatum (Caudate Nucleus and Putamen): In most cases a marked loss of nerve cells in the striatum was coupled with a notable increase in overall cellularity, caused mainly by large numbers of astrocytic nuclei. These changes were always diffuse throughout the striatum, but frequently they were not of uniform intensity, especially in coronal sections through the head of the caudate nucleus and the anterior quarter of the putamen. In those cases (about half) where sections included the inferior segment of both areas, the lowermost parts were much better preserved than the higher levels were. Indeed, in several instances there were only minor changes in the region where the putamen and caudate nucleus fuse ventrally, although the areas above this were severely involved. The changes in the gray matter bridging the internal capsule were identical to those in the immediately adjacent striatal mass. The medial half of the head of the caudate nucleus sometimes showed a little more glial reaction than did the lateral portions; this was less often true of the anterior part of the putamen. In the few cases where sections of these areas had been made in the horizontal plane, the changes were evenly distributed save for some accentuation at the extreme anterior tips of both structures. The middle and posterior parts of the putamen usually showed uniform involvement which, for the most part, was of the same intensity as that observed in the superior parts of the anterior quarter, although occasionally it was a little more or a little less prominent. The changes in the tail of the caudate nucleus were always similar to those in the most severely affected parts of the head.

Often there was little or no difference in overall intensity between the changes in the caudate nucleus and those in the putamen as assessed by nerve cell counts and subjective impressions of the amount of gliosis. In six cases, however, astrocytosis in particular was clearly more pronounced in the caudate nucleus. In 16 cases the striatum showed gross neuronal depletion, the average cell count per high power field

b ing less than 5 and sometimes as low as 3, a against counts in the region of 30 in the n rmal unshrunken striatum. In four of the fi e other cases, at least half of the normal c l complement had been lost. In the re- n ining case, only mild and somewhat p tchy loss was apparent. This was the case w ere no definite shrinkage of the striatum h d been observed grossly. The patient was a 77-year-old man who had been observed t have a relatively mild form of the dis- e se for eight years, and who had died from myocardial infarction.

The small nerve cells invariaby appeared to be much more reduced in number than the large forms did, and in several instances the latter constituted more than a third of the residual nerve cells, in contrast to their relative sparsity in the normal striatum. In a few cases where the striatal lesion was far advanced, however, a moderate loss of large cells had occurred. Especially in those instances in which neuronal depletion was most marked, the remaining small cells exhibited irregular loss and pallor of cytoplasm, and at times the nuclei appeared to be almost bare. The large cells commonly contained large amounts of lipochrome, and sometimes showed areas of cytoplasmic pallor and mild shrinkage. In addition, in many cases there were numbers of grossly degenerate neurons with marked nuclear pyknosis; these may have been derived from either cell series. No acute cellular changes or neuronophagia was seen. Bodian preparations frequently showed marked loss and distortion of the neurofibrils. Loss of fibrils, however, was usually less conspicuous than was deficiency of neurons. The bundles of myelinated fibers in the inner putamen and the lateral half of the head of the caudate nucleus were always markedly shrunken in those cases where the other changes were most severe.

The astrocytosis which accompanied neuronal degeneration was usually striking, and in general paralleled the loss of nerve cells. Commonly, the nuclei of the astrocytes were

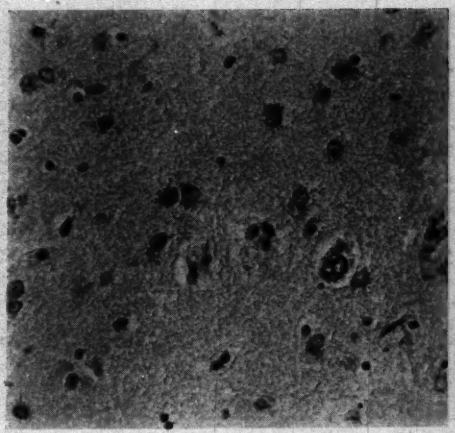

FIG. 4. Caudate nucleus. Marked astrocytosis and loss of small ganglion cells. A large ganglion cell is present (hematoxylin and eosin; reduced from ×350).

larger and more vesicular than normal (Figure 4), and in some cases prominent collections of fine yellow pigment granules surrounded the nuclei. In a few instances, swollen acidophilic cytoplasm identical to that of the gemistocytic astrocyte was conspicuous, but in most cases the cytoplasm of the astrocytes did not stain with hematoxylin and eosin. In the cases where Cajal preparations were available, moderate hypertrophy of the astrocytes was usually apparent. PTAH and Holzer stains often showed marked fiber formation, although occasionally it was minor in comparison with the degree of astrocytosis.

A mild thickening or increased density of the subependymal fibrillary zone was common in the caudate nucleus, while the adjacent gray matter often showed fine, spongy rarefaction. In several cases a striking, diffuse prominence of the capillary network was evident, caused by numerous collapsed channels lined by plump endothelial cells. Widening of the perivascular spaces, sometimes marked, was a frequent finding, and often the spaces contained small numbers of siderophages. Although the walls of the arterioles sometimes showed moderate

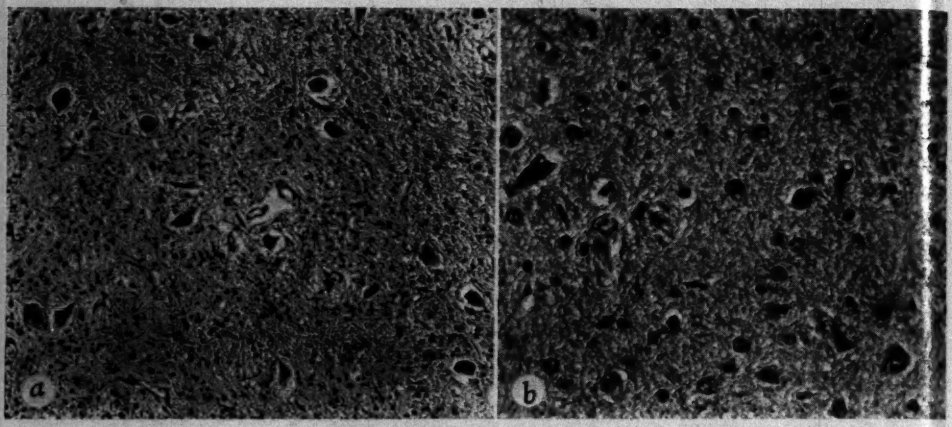

FIG. 5. *a:* Globus pallidus. Crowding of nerve cells and oligodendrocytes. Pigmentation and irregular shrinkage of the ganglion cells (hematoxylin and eosin; reduced from ×150). *b:* Centromedian nucleus of thalamus. Pigment atrophy of the neurons and moderate astrocytosis (hematoxylin and eosin; reduced from ×350).

sclerosis, degenerative changes were rarely pronounced. Not infrequently, small globular deposits of blood pigment were lying free in the matrix of the striatum, and in some instances an occasional siderotic basophil spherule was noted in the putamen. A number of representative sections stained with the rubeanic acid method for copper gave negative results.

Amygdaloid Nucleus: This structure was usually well preserved, but in a few instances it showed slight astrocytosis and some neuronal atrophy.

Claustrum: Patchy loss of nerve cells and mild astrocytosis of an intensity and character similar to those seen in the deeper layers of the cerebral cortex were sometimes observed.

Globus Pallidus: The outer division frequently showed mild to moderate shrinkage, with a corresponding crowding of the oligodendrocytes and nerve cells (Figure 5*a*). As a result, some loss of nerve cells could well have been obscured, but the disposition of the cells gave no indication of any significant depletion. Pronounced shrinkage and distortion of the nerve cells were observed in some cases, and lipochrome was usually prominent in the cytoplasm. In a few instances, occasional grossly shrunken or faintly staining forms were seen. Slight astrocytosis and scattered deposits of blood pigment were commonly observed. The changes were sometimes more pronounced in the anterior third of the outer division than elsewhere, and were usually most obvious in those cases where the striatal lesion was far advanced. With one exception, the inner division showed no significant shrinkage, while the other changes noted in the outer division were either absent or much less marked. There was no evidence of any significant disturbance of either the fasciculus or the ansa lenticularis.

Thalamus: The centromedian nucleus sometimes showed a slight or moderate increase in cellularity (Figure 5*b*), caused chiefly by astrocytosis, and in a few instances the nucleus appeared to be moderately shrunken. In the latter cases the striatal lesion was always in the most severe category. Whereas the nerve cells often showed some pigment atrophy, there was never any obvious reduction in their numbers. Mild astrocytic hyperplasia was observed occasionally in other parts of the thalamus, and in one of the two cases where a prefrontal lobotomy had been performed

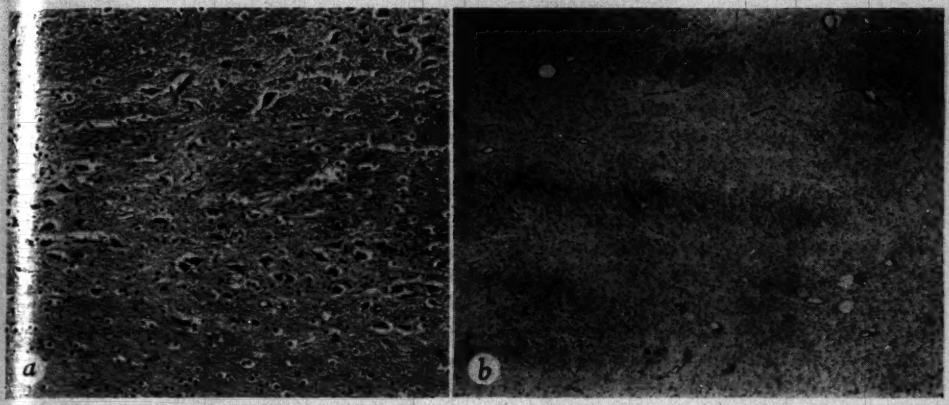

FIG. 6. *a:* Nuclei pontis. Atrophy with marked neuronal shrinkage and hyperchromasia (hematoxylin and eosin; reduced from ×150). *b:* Dentate nucleus. Prominent loss of nerve cells. Crowding of oligodendrocytes in white matter (cresyl violet; reduced from ×30).

there was marked proliferation in the dorsomedial nucleus. In general, there was some excess of lipochrome in the nerve cells of all parts of the thalamus.

Subthalamic Area and Midbrain: A slight excess of neuroglia was observed occasionally in the subthalamic and red nuclei, and in the periaqueductal gray matter, and mild or moderate degrees of pigment atrophy were fairly common in the neurons in these areas. In no instance, however, was there any evidence of loss of nerve cells or of gross neuronal degeneration. The substantia nigra and other parts of the midbrain and subthalamic area appeared to be unremarkable. A section from some part of the hypothalamus was examined in most cases; no significant abnormality was found.

Pons and Medulla: Cell and myelin preparations from two or more levels of both structures showed that the tegmental nuclei and tracts and long tracts elsewhere were essentially intact in all cases. Mild or moderate pigment atrophy was frequently present in the ganglion cells of some of the tegmental nuclei. In the two cases where pontine atrophy was conspicuous on gross inspection, the main changes were in the nuclei pontis. These showed diffuse wasting, and their constituent neurons were usually deeply basophilic and often severely shrunken and angular (Figure 6*a*). No definite evidence of loss of nerve cells was apparent, although a deficiency may have been masked by crowding of the existing cells. In one case there was some thinning of the transverse pontine bundles. In four other cases, similar but considerably milder changes were noted in the nuclei pontis. In each of the six cases where the nuclei pontis were affected, cerebral cortical as well as striatal involvement was prominent. In the medulla the inferior olives often showed slight focal loss of nerve cells and a mild excess of neuroglia; in no instance, however, were these changes significantly in excess of those sometimes seen in control material.

Cerebellum: In six cases the cortex showed a possible patchy loss of Purkinje's cells, but in these and the other cases the bulk of these cells was well preserved. Bergmann's nuclei were a little more prominent in some cases than in others, but otherwise the molecular layer was unremarkable. The dentate nuclei showed a significant patchy or diffuse loss of cells in nine cases, and in three of these the loss was marked, with reduction of the cell population to approximately half the normal numbers (Figure

6*b*). Mild neuroglial proliferation usually accompanied the neuronal depletion. Moderate shrinkage and hyperchromasia were present in a varying proportion of the surviving nerve cells in some cases, and lipochrome was always prominent. In most of the remaining 12 cases the dentate nuclei showed slight focal loss of cells, but the cell content in many areas was within normal limits. The amount of disturbance of these nuclei did not appear to be related to the intensity of the lesions at higher levels.

Because of the more dispersed character of the roof nuclei, quantitative neuronal changes were more difficult to assess. In several of those cases where the dentate nuclei were most severely involved, the emboliform nuclei showed a probable slight loss of cells, but otherwise no clear deficit was apparent. The individual neurons of the roof nuclei closely reflected the appearances of those in the dentate nuclei. Moderate widening of the perivascular spaces in the cerebellar white matter and crowding of the interfascicular oligodendrocytes were noted in a few cases, while in two there was widely dispersed basophilic siderosis of the arterioles and capillaries in the dentate nuclei and adjacent areas.

Spinal Cord: No significant loss of nerve cells in the gray columns was evident. The anterior horn cells, in particular, often contained large amounts of lipochrome, and in some cases were slightly shrunken. In the white matter, at all levels, myelin stains commonly showed slight degrees of pallor, chiefly confined to the central portions of the posterior funiculi and the margins of the lateral funiculi. A slight increase of neuroglial elements was sometimes encountered in the posterior funiculi, and less frequently in the white substance elsewhere.

DISCUSSION

The findings in this study emphasize that striatal degeneration is the dominant and most constant nervous lesion in Huntington's chorea, and that the changes that occur in other parts of the nervous system are usually mild by comparison.

The gross and histologic changes observed in the striatum were for the most part similar to those described in many earlier reports. The microscopic appearances were clearly indicative of a relentless, slowly progressive degeneration of the ganglion cells. There was no evidence of any acute change that would suggest an episodic flare-up in the condition. The astrocytosis stimulated by the injury to the nerve cells was striking, and often there was marked production of fibers. This study confirmed that the degenerative process predominantly affects the small ganglion cells; the large ganglion cells, however, frequently showed mild changes, and in the end stages of the disease some depletion of their numbers may become apparent. It could be argued with reason that the changes they showed are entirely secondary to the gross alteration in their external environment.

Several reports have described differences in the intensity of the lesion in various parts of the striatum. Thus, in the 17 cases described by Dunlap (6), narrowing of the putamen was especially noticeable, and neuronal depletion and gliosis were most conspicuous in the middle and posterior parts of the putamen. The gross observations in three of the six cases recorded by Stone and Falstein (17), and the nerve cell counts performed in one case by Kiesselbach (9), however, suggest that the caudate nucleus may be more severely affected at times. In the present group of cases the caudate nucleus often appeared to be rather more shrunken than did the putamen, and in six cases gliosis was more conspicuous. In the majority of cases, however, the overall intensity of the histologic changes in the two divisions did not differ significantly. Moreover, aside from the tendency toward sparing of the tissues in the most inferoanterior parts of the putamen and the head of the caudate, the se-

verity of the degeneration in the rostral and caudal parts of the striatum rarely exhibited any obvious difference.

The close pathologic resemblance of Huntington's chorea to Pick's disease when the latter involves the striatum has been pointed out; but in Pick's disease the large as well as the small cells of the striatum are involved, and the posterior part of the putamen tends to be spared (10, 15). The possibility of confusion with any other form of striatal degeneration on a purely morphologic basis is remote.

The present material illustrates clearly that the amount of cerebral atrophy and cerebral cortical degeneration in Huntington's chorea varies markedly, and in some cases may be inconspicuous. Dementia had been prominent in a number of the cases where only mild cortical degeneration was observed. Some correlation was noted between the extent of the involvement of the cerebral cortex and that of the striatum. In those cases where cortical changes were most severe the striatal lesions usually were most advanced, and *vice versa*. There were, however, several exceptions to this rule, the most notable a case where the cortical disturbance was as great as any in the group but the striatal involvement less than that in the majority.

In distribution and other characteristics the gyral atrophy in these cases of Huntington's chorea closely resembled that seen in the ordinary senile brain. This similarity was equally striking in respect to the histologic changes in the cerebral cortex, no significant difference between the character of the degeneration in the two conditions being observed. Thus, the cortical disturbance in the cases of chorea appears to represent an excellent example of uncomplicated premature aging of nervous tissue.

Other parts of the brain which sometimes showed more than slight disturbance were the pallidum, the centromedian nucleus of the thalamus, the dentate nucleus of the cerebellum, and the nuclei pontis. The changes observed in the pallidum consisted principally of mild shrinkage of the external division and crowding of its normal constituents. These changes were similar to those described by Dunlap (6), who stated that they are consistent with secondary atrophy resulting from the striatal lesion. The changes seen less regularly in the centromedian nucleus were of the same character as those in the pallidum, and since this nucleus is also known to have connections with the striatum, they may be determined on the same basis. Loss of nerve cells from the dentate nuclei has been one of the more consistent lesions noted in the neuraxis in earlier reports, and was a significant finding in nine (43 per cent) of the present cases. Conspicuous shrinkage of the nuclei pontis, observed in two cases, does not appear to have been described previously. No evidence produced suggests that any of the changes referred to in this paragraph are of any clinical significance.

Although the subthalamic and red nuclei occasionally showed a slight excess of neuroglia, there was never any indication of a significant disturbance in the subthalamic area. This point is emphasized because of the ability of lesions in this region to produce certain forms of involuntary movement, and because considerable involvement of this region has sometimes been described in cases of Huntington's chorea (1, 11). In this area, and at lower levels of the neuraxis, pigment atrophy of the neurons was commonly seen. The changes, however, were not appreciably in excess of those sometimes seen in the senile brain. The slight pallor frequently seen in parts of the posterior and lateral white matter of the spinal cord in myelin preparations also would appear to be of a character similar to that occurring in senility (3).

The two mother-and-son pairs in the series showed the phenomenon of anticipation. Both males had died as a direct result of the disease at the ages of 36 and 38 years, and their mothers were aged 61 and 53, re-

spectively, at the time of death. In each son the changes in the cerebral cortex were more prominent than those in the mother, and in one son the striatal lesion also was more pronounced. One son showed marked shrinkage of the nuclei pontis; this structure was not involved in his mother.

Although geneticists have been inclined in recent years to dismiss so-called anticipation as a mere statistical artifact, individual differences in age of onset, and type and severity of manifestation both within and between generations in a Huntington's chorea kinship, appear to demand further explanation. In this study the finding of a qualitative morphologic difference (involvement of the nuclei pontis) between a mother and son as well as quantitative differences in the cortical and striatal changes is of some interest.

The exact neural mechanisms responsible for the production of choreiform and allied types of involuntary movement have not been clearly established as yet. Those that occur in Huntington's chorea have usually been attributed to the striatal lesion. Hunt (8) and others have suggested that the small cells of the striatum act in an inhibitory and co-ordinating capacity to the pallidum, and that their destruction brings about the motor phenomenon of the disease. This view seems to derive support from the results of pallidotomy in Huntington's chorea (16). Other surgical studies, however, have shown that such movements may well be produced by nervous impulses transmitted by both corticospinal fibers and indirect cortical-subcortical-spinal pathways (2). It has been suggested that striatal damage in this disease provides the only explanation of involuntary movements in terms of cortical physiology, "for only the absence of a clearinghouse for suppressor reactions could explain the in-co-ordination of cortical motor automatisms which make up the motor symptomatology" (5).

The basic disorder underlying the nervous degeneration in this malady remains obscure. A limited amount of biochemical investigation has given no pointers, whereas the general pathologic findings provide no indication of an association with any extracranial lesion or disturbance that might suggest the presence of a predisposing systemic toxic or metabolic dyscrasia. On the basis of the available evidence the disorder probably is entirely intraneuronal, and an inherited deficiency of some such essential cellular component as an enzyme may well be the responsible factor.

SUMMARY

The pathologic findings in 21 cases of Huntington's chorea have been described. Striatal degeneration was invariably the dominant lesion. Histologically, the lesion was characterized by diffuse loss of small ganglion cells and marked reactive astrocytosis. The large ganglion cells of the striatum were substantially spared by the process. Although shrinkage and gliosis were sometimes rather more obvious in the caudate nucleus than in the putamen, both structures were, for practical purposes, similarly involved. Each division showed a virtually uniform involvement of the entire substance, aside from a common tendency for the most inferior parts of the anterior segment of each to be appreciably less affected. The globus pallidus frequently showed a mild or moderate secondary atrophy, with no evidence of loss of nerve cells. Less often, similar changes were noted in the centromedian nucleus of the thalamus.

Although pronounced degrees of gyral atrophy often occurred, wasting was slight in seven cases. The microscopic changes in the cerebral cortex varied correspondingly, but were always mild as compared with the striatal lesion. The cortical degeneration closely resembles that of simple senile atrophy.

The dentate nucleus of the cerebellum showed an obvious loss of nerve cells in nine cases, and in three this was conspicuous. In two cases there was marked atrophy

o the nuclei pontis. Other parts of the nervo s system, including the subthalamic area, s owed no significant changes.

The general pathologic findings revealed r evidence of any underlying systemic dist rbance.

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THE RESPONSE OF ADULT SCHIZOPHRENICS TO CALORIC STIMULATION

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In 1940, Angyal and Blackman (1) reported that schizophrenic patients responded to caloric or rotatory stimulation with a decreased frequency of nystagmus and a decreased total number of nystagmic beats when compared with controls. Recently Colbert *et al.* (3) reported similar results for schizophrenic children. These authors concluded that the vestibular abnormality in schizophrenic children is similar to that in schizophrenic adults. Other investigators, however, have found that all non-catatonic schizophrenics have a normal caloric response (2, 9). This study was conducted to investigate possible factors responsible for the discrepant reports of vestibular abnormality in schizophrenics. A number of these studies (1, 8–10, 13) have been ably reviewed by Fitzgerald and Stengel (5).

METHOD

The schizophrenic group was chosen from patients recently admitted to the semi-disturbed wards of Bellevue Psychiatric Hospital. These subjects met all of the following criteria: a definitive diagnosis of schizophrenia made by a psychiatrist; delusions or grossly illogical speech or auditory hallucinations; no disorientation, no history of alcoholism or drug addiction, and some historical or present evidence of bizarre behavior or severe social maladjustment.

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Six of the schizophrenics were diagnosed as paranoid. In the remainder no one subtype of schizophrenia was clearly dominant. The subjects were 20–55 years old. The first episode of illness had occurred prior to age 40; the present episode had lasted for three or more months, or there had been at least one earlier episode of three or more months' duration. Only three schizophrenic subjects received tranquilizing drugs (chlorpromazine) during their present hospitalization. None of the three received this drug within four days of testing, and no subject, experimental *or* control, received any medication at all for at least 36 hours preceding testing.

The control group was selected from a non-psychiatric patient population. These were patients recently admitted to the medical and surgical wards of Bellevue Hospital with conditions unrelated to the vestibular system or central nervous system. They were selected if they had no history or symptoms of neurologic disease, if they had no symptoms of mental illness, and if they had never taken tranquilizing drugs. Their ages were 22–55.

Subjects who failed to respond to every trial were called "non-responders." Those who responded to all trials were called "responders." The two groups were considered separately because they may have differed qualitatively from each other. Consecutive schizophrenic admissions who met the criteria for entry into the study were selected and tested until a group of 15 "responders" had been found. This required the selection of 21 schizophrenics. Ten responders were male and five were female. A control responder group was selected and matched for sex with the experimental responder group from consecutive, eligible control ad-

missions. To do this it was necessary to test 20 eligible controls. Thus the final control group was composed of 20 subjects, of whom 15 were responders. The final experimental group was composed of 21 subjects, 15 of whom were responders. Each responder group was made up of ten males and five females.

In this study we used the method of Angyal and Blackman (1) for caloric testing, with slight modification. Twenty cubic centimeters of water at 20° C. were syringed into one ear over a ten-second interval. The same ear was tested again after an interval of at least five minutes. The number of beats was counted on a Miltex counter and duration of response timed with a stop watch.

Our procedure differed from Angyal's in that we asked our subjects to tilt their heads back and look straight at the ceiling for 30 seconds after the ear was irrigated, rather than for 60 seconds. This was done because after 30 seconds our subjects became restless and began to change their positions. Preliminary experiments indicated that this alteration did not significantly affect the response.

We measured duration of response from the time the head was moved back, rather than from the first nystagmic beat. The first beat always occurred within five seconds of tilting the head back. Fitzgerald and Hallpike (4) and Colbert *et al.* (3) also measured duration of nystagmus from a point of their own choosing, rather than from the first nystagmic beat.

RESULTS

Table 1 compares the mean score of the entire schizophrenic group with that of the controls. Each subject had two trials. There were no significant differences along any of the parameters. Insignificant differences that did exist between the total group were magnified by the failure of a few subjects to respond to the stimulus. There were more such non-responders in the schizophrenic group, and their zero scores lowered the schizophrenic mean scores markedly.

TABLE 1
Total Groups

	Duration (sec.)		Number of Beats		Frequency	
	Schiz.*	Controls†	Schiz.	Controls	Schiz.	Controls
Mean	56.0	62.8	73.2	92.4	0.966	1.222
S.D.	38.1	29.1	61.8	53.3	0.686	0.550
	U = 206		U = 147		U = 158	
	$p = 0.92$		$p = 0.09$		$p = 0.17$	

* N = 21
† N = 20

TABLE 2
Responders Only

	Duration (sec.)		Number of Beats		Frequency	
	Schiz.*	Controls†	Schiz.	Controls	Schiz.	Controls
Mean	74.4	74.8	99.7	110.1	1.306	1.426
S.D.	27.8	22.0	53.8	47.9	0.637	0.409
	U = 105		U = 103		U = 90	
	$p > 0.1$		$p > 0.1$		$p > 0.1$	

* N = 15
† N = 15

Table 2 compares the 15 schizophrenic responders with the 15 control responders. Each subject had two trials. Here all subjects with a zero have been excluded, and the differences between groups are strikingly small.

The explanation for a zero response is not clear. Technical errors cannot be solely responsible. For example, we continued to test one subject who failed to respond on seven out of nine consecutive trials, although great care was taken to assure adequate irrigation on all trials. Obviously, permanent damage to the vestibular apparatus is not the answer either.

A non-parametric statistic, the Mann-Whitney U Test (12), was used in the analysis of data. This test was used because distribution of our data did not allow us to make the assumptions necessary for the use of parametric tests. Furthermore, it has been suggested that one characteristic of

schizophrenic groups is a significant increase in variability of these groups compared to non-schizophrenic controls (6), thus making a parametric test inappropriate in comparing samples drawn from such groups. Although they are not used in calculations for the Mann-Whitney Test, group means with their S.D.s have been reported in the tables, together with U and *p* values.

DISCUSSION

Our data agree with those of Claude *et al.* (2) and Lowenbach (9), who reported normal responses in non-catatonic schizophrenics. They seem to disagree with those of Joo and Meduna (8) and Sercl and Vinar (13). Fitzgerald and Stengel (5) did find certain differences between the caloric responses of schizophrenics and those of clinically normal people, but found that only six out of 50 schizophrenics had a diminished duration of nystagmus. They did not measure the number of nystagmic beats. No further comparison of our data with those of the above reports is possible because statistical data or raw scores are not available in the presentations of these authors.

Angyal and Blackman (1) analyzed their data statistically, but did not separate zero from non-zero responses. There may have been a greater percentage of non-responders in their schizophrenic group than in ours. This alone could account for the discrepancy between their data and ours.

When this discrepancy is considered, several other factors must be noted. The first is the reliability of the parameters used in these studies. Our raw data indicate that duration is the most reliable parameter, with 25 of the 30 "responders" getting a second trial score within 33 per cent of their score on the first trial. The number of beats and frequency of response are less reliable. These data agree with those of Lowenbach (9), Jongkees (7) and Pfaltz (11). The latter, using photoelectronystagmography, concluded that the number of beats varies too greatly to make this a useful quantitative measure of vestibular function.

Another source of discrepancy may be differences between our patient group and that studied by Angyal and Blackman. Our patients seemed less deteriorated than theirs, showed none of the distortions in body image reported by Angyal's group, and had been hospitalized for a much shorter period of time. Angyal's group had a mean hospitalization time of five years. Our group's mean was less than one year, and the group contained only two patients who had spent more than one year of aggregate time in mental institutions. Angyal's controls are described only by the word "normal," so we cannot compare them to ours.

SUMMARY AND CONCLUSIONS

A review of the literature reveals great disagreement concerning the usefulness of caloric testing as a means of differentiating the vestibular responses of schizophrenic and non-schizophrenic subjects.

The data reported here demonstrated no significant difference between adult schizophrenics and patients without mental disease as to duration of nystagmus, number of nystagmic beats or frequency of nystagmus following caloric stimulation.

The interpretation of future investigations of vestibular function in schizophrenia will be aided by adequate characterization of the experimental groups, by consideration of the reliability of the test parameters used, and by distinguishing complete failure to respond to the stimulus from a response which is simply below normal.

On the basis of the existing literature and the present study, it does not appear that a significant difference has been demonstrated between the speed or duration of nystagmus in adult schizophrenics and in normal controls following caloric stimulation.

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SYMPOSIUM: THE PSYCHOGIST IN UNDERGRADUATE MEDICAL EDUCATION[1]

INTRODUCTION

BERNARD LUBIN, PH.D.[2]

This symposium builds upon the work of previous conferences, and upon meetings in which psychologists employed in medical schools have attempted to come to grips with problems encountered in their work settings.

Although psychologists have been employed in medical schools for a number of years, one need go back only a decade or so to find in this group evidence of concern with the delineation of a professional image. In 1951 the Education and Training Board of the American Psychological Association created a Committee for Psychology and Other Professional Schools. A subcommittee headed by Dr. Ivan N. Mensh was appointed to study psychology in the medical schools (5). Fifty-eight of the 79 medical schools in operation at that time reported a total of 255 psychologists employed. Dr. Matarazzo and Dr. Daniel, surveying the situation again in 1955, found 346 psychologists employed in 68 medical schools (4). The number has certainly increased since. The Baine-Jones Report recommended that, to maintain the 1955 ratio of 132 physicians to each 100,000 of the population, the nation would have to build as many as 20 new medical schools by 1960 (3). As a consequence, the number of psychologists employed in medical schools will certainly continue to increase.

Just prior to the 1956 Conference on Psychology in Medical Education, held at Teachers College, Columbia University, five major roles for psychology in the medical setting were listed: teaching, research, clinical services, selection of medical students, and administration (2). Our major concern here is with the first of these—teaching—and specifically, teaching the undergraduate medical student. Much interest was provoked by the 1957 Midwestern Psychological Association Symposium on Psychology as a Basic Science in Medical Education (1). At that symposium, and at other meetings, the suggestion was made that a future convention should provide opportunity for the discussion of courses taught by psychologists to undergraduate medical students. The present symposium was organized to make such an opportunity available.

In discussing a specific course offered in a medical school, one must also consider such issues as the role of the psychologist in the medical school, the relationship between psychology and the other disciplines, and the general goals of medical education. Although the following papers refer primarily to specific courses, they also deal with some of these other important issues.

[1] This symposium, of which Dr. Lubin was chairman and Dr. Mensh discussant, was presented at the American Psychological Association meetings, Chicago, September, 1960.

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PSYCHOLOGISTS' PARTICIPATION IN PRECLINICAL TEACHING OF PSYCHIATRY TO MEDICAL STUDENTS

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A current trend in medical education is the inclusion of the behavioral sciences in the preclinical years. In medical schools where this is encompassed within the department of psychiatry, behavioral science data and viewpoints are usually incorporated in the first- and second-year psychiatry courses. A whole course, or a unit in a larger course, may be devoted to the behavioral sciences (2, 4, 11). In schools where behavioral science teaching takes place in the Department of Preventive and Environmental Medicine, the emphasis is primarily on sociologic and epidemiologic considerations. The latest development is the creation in some medical schools of a new, administratively autonomous Department of Behavioral Science (10).

These innovations in medical education have both an ancient and a modern history. The ancient history has to do with the frequently heard critique that education of the physician is narrow and deficient in the humanities, a complaint to which the charge of social science deficiency is a latter-day addendum. This stands as a background for a line of current history leading out of the post-war burgeoning of clinical psychology to its present prominence in the field of mental health. In the early post-war years, clinical psychology (especially psychoanalytic psychology, as a personality theory, a body of knowledge and realm of research) began to be spoken of as the basic science of psychiatry. The work of David Rapaport and others (7) earned status and respect for the contributions of clinical psychology to the study of personality processes, psychopathology and psychotherapy. It is mainly on the proposition that clinical psychology is the basic science of psychiatry that clinical psychologists have acquired teaching and research functions in medical school departments of psychiatry.

The most recent innovation, a Department of Behavioral Science in the medical school, derives from a more extensive concept of psychology—not just clinical but all of psychology—as a science much broader than the areas of psychopathology and psychotherapy. Scientific psychology includes numerous other major branches—learning theory, experimental and physiologic psychology, social and developmental psychology, to mention a few of the traditional areas. There are the newer branches of communication theory, psycholinguistics and semantics, cybernetics, and mathematical and computer machine psychology. More broadly, the place of psychology in the medical schools is established on the proposition that, while it pertains to psychiatry, it is a science as basic to all of medicine as are biochemistry, physiology, pharmacology and the others. This view of psychology has been facilitated by its embodiment into these traditional basic sciences with the rise of such new, hyphenated, hybrid disciplines as psychophysiology, psychopharmacology and psychoneurology. The new interdisciplinary trend in research has also furthered an interdisciplinary trend in teaching. Psychologists, sociologists and anthropologists are appearing with increasing frequency in the classrooms, laboratories and hospital halls of medical schools. One other trend of the times contributing to this development in medical education comes from new concepts

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of health, illness and recovery which take cognizance of interrelated equilibriums of forces in the biologic, the psychic and the social spheres. Medicine is also undergoing a redefinition of its place in society and its responsibility for individual and mass survival under rapidly changing social, political and cosmic conditions.

Appearance of the behavioral sciences in the medical curriculum coincides with a shift from exclusive interest in disease to inclusive interest in the person with the disease. In the words of McKittrick, "An understanding of the behavior, the human needs, and the progress—not of abstract disease but of individual sick persons—is an essential component of every good program in medical education" (5). Noting that "addition of the social sciences to the natural sciences" may facilitate the solving of clinical problems, Pellegrino proposes that "the study of institutions, values, culture, and communication . . . can be important in our comprehension of the patient's response to illness" (6).

But he also notes an opposing view among "those who are exquisitely sensitive to the contributions of the physical and biological sciences to medical education and practice." Conservative educators "fear any change which might make medicine less critical, less exacting, and less inquiring" (6). Educators whose definition of medicine does not include the ecologic concept of man in interaction with his environment tend to oppose the behavioral sciences as a dangerous incursion of the medical curriculum, as "popular but unscientific metastases from the humanities," tending to convert the "physician scientist" into a "drug-dispensing social worker" (14).

Curriculum builders must find a formula to combat criticism of the behavioral sciences for insufficient scientific rigor while moving out of the old program which disdained the regularities of psychic processes and social forces. Typically, the criticism was directed at the lack of more precise methods for quantifying as yet imponderable and hardly measurable complex events. Another compelling factor is that the behavioral sciences have a relatively meager body of medically pertinent, tested knowledge in comparison with the regular preclinical sciences. Of all the levels at which man the organism functions most integrally, the hierarchically topmost level—that of human interdependence—is the least predictable, the least reducible to laboratory methods of research, and the one most fraught with theoretical concepts difficult to verify.

If clinical psychology is acknowledged as the basic science of psychiatry, and behavioral science becomes basic to all of medicine, where does the teaching of psychiatry fit into the undergraduate curriculum? In some schools with behavioral science courses, psychiatry proper is not taught in the first year, and appears on the way to being replaced entirely in the preclinical years.

The 1951 Conference on Psychiatry and Medical Education reported "considerable respect among medical educators for the part played by selected, competent and broadminded psychiatrists in the education of good physicians," but less "regard for psychiatry as a body of scientific principles and working hypotheses" (15). Psychiatry does not have the status of a basic science and, the report noted, "clinical skills and attitudes, though deeply significant, are an insufficient foundation in medical education" (15). However, curriculum time for the preclinical teaching of behavioral science appears to be on the increase, and in some schools fills a sizable block of hours. At the Albert Einstein College of Medicine "the course runs for one semester in each of the first two years for a total of 156 hours" (13).

The behavioral science trend in medical schools seems to be following two major lines of development. Incorporated into the Department of Psychiatry, it now serves as

a scientific introduction to descriptive and dynamic psychiatry, whereas previously "the basic science aspects of psychiatry were presumed to be covered by neuroanatomy, neurophysiology and neuropathology" (5). But it is also held by some that, in just its psychodynamic aspect, psychiatry brings a basic science to the medical curriculum (15). In an autonomous division or department, outside the Department of Psychiatry, the behavioral sciences can serve a more generalized function as a new, independent, emergent combination of sciences basic to medicine as a whole.

In this matrix of changing concepts in medical education, the Albert Einstein College of Medicine came into existence in September, 1955. A new school, it has been receptive to educational innovations. New ways of teaching were tried in its Department of Psychiatry, and the preclinical courses were modified from year to year. Two classes have now been graduated, and the Psychiatry Department is just beginning to reap some local rewards of its teaching efforts. The first class (50 students) completed internships and began residencies in July, 1960. Three of the 12 current first-year residents in psychiatry are Einstein graduates. The major viewpoint in the Department of Psychiatry is psychoanalytic, and a degree of theoretical sophistication may be observed in the medical students as they rotate through psychiatry in their third and fourth years. The diagnostic and dynamic discernment demonstrated by these students in their taking of histories and presentation of cases compares very favorably with that of first-year residents from other representative medical schools. With the arrival of Einstein graduates, the Department of Psychiatry has begun to evaluate its undergraduate product on the proving grounds of the residency program.

In early bulletins of the school, medicine was defined as "a social, as well as a natural science." This view, incidentally, had already been formulated by Rappleye in 1947 when he wrote that "... medicine is as much a social as it is a biological science" (8). The current bulletin includes among the educational goals of the school the enlargement of the student's "understanding of the development of the human being as a thinking, perceiving, believing, sensing organism interacting with friendly and hostile forces in a variety of environments. Studies in human behavior and in preventive and environmental medicine provide this scope in the first two years" (1).

The behavioral science aspects of this philosophy are reflected in the structure of the Department of Psychiatry, which has a Psychology Division, and a Research Division with a psychologist (Dr. Sibylle K. Escalona) as associate director, where behavior is studied in its combined biologic, psychic, social and cultural dimensions. The first- and second-year courses in psychiatry were originally planned and taught with the active participation of psychologists and a cultural anthropologist. When the curriculum was revised in 1958, Dr. Escalona designed the first-year course, giving nearly all of the lectures, and co-ordinating the exercises, demonstrations and small-group teaching. The earlier program has been described by Dean Kogel (3). In the last two years the preclinical courses have been redesigned, and have been conducted by Dr. Herbert Weiner, a U. S. Public Health Service career teacher in psychiatry. He has compiled extensive mimeographed lecture notes which are used as a basic reference and which, if revised and edited, may be published as a behavioral science textbook in psychiatry for medical students (12).

The structure of the courses has remained the same since the beginning, a threefold format of 1) lectures; 2) exercises consisting at various times of case demonstrations, patient interviews, observation of infant research, experiments in psychophysiology or subliminal perception, and diagnostic

testing, described below in detail; 3) small-group discussions.

In the second semester of the first year the students spend one morning a week in psychiatry; the first semester of the second year, two mornings a week. The class of 96 convenes for a one-hour lecture covering, among other topics, motivation, control and regulation, adaptive functions, conflict and defenses, individual and group behavior, and psychopathology. The students then form into small groups of from seven to 12, each with its own instructor. With their regular instructor (sometimes under the guidance of another psychiatrist or psychologist), the groups spend the next hour in an assigned exercise, or at clinical case demonstrations. The third hour is usually devoted to small-group discussion of the lecture, the exercise material or the readings of the week. The groups are conducted according to the principles of *Small Group Teaching in Psychiatry for Medical Students*, formulated by the Committee on Medical Education of the Group for the Advancement of Psychiatry (9). Introspection and self-perception are encouraged, with a view to developing the student's self-calibration toward transference and counter-transference objectivity in the doctor-patient relationship; but group psychotherapy is not a purpose of the small-group sessions.

One of the authors (WK) has served as a group instructor for the last four years, given an occasional lecture in the courses, and devised various experiments in the small groups to illustrate the interplay of psychic determinism and social reality. The other (JR) in the last four years has developed and conducted the set of exercises in diagnostic testing described below.

In the report of the 1951 Conference on Psychiatric Education, one aim of undergraduate teaching is the development of the medical student's diagnostic ability through physical and psychiatric examination, and "the use and critical interpretation of adjunctive methods," including "psychological examinations." The Conference further specified that the student should "have an elementary understanding of common standard tests and measurements and of accepted projective techniques—their value and their limitations—and that he have at least some acquaintance with techniques of individual assessment" (15). Diagnostic training "also implies a reasonable understanding of the zones of healthy and sick behavior in our society" (15). The goal of the exercises in diagnostic testing is to provide an opportunity for the medical student to see and experience the methods employed by an allied discipline in the acquisition, organization and interpretation of behavioral data; more specifically, to further the Conference aim of developing diagnostic skill through knowledge of normal ranges and the differential distinctions of normal and pathologic responses. Psychiatry looks largely to diagnostic testing for a systematic and, to a degree, quantified assessment of deficit behavior, be it due to intellectual deficiency or to psychopathology. Diagnostic testing also assists in defining the extent and ways in which adaptive functioning is impeded by the presence of a pathologic process or defective potential.

In the clinical psychology laboratory exercises, second-year medical students in their small groups administer a battery of sample test items to themselves, and then administer the same test samples to a non-psychiatric patient population. In this way the student becomes both patient and doctor, and has an opportunity to familiarize himself with both roles. The exercises were initiated in the fall of 1956 at the suggestion of Dr. Morton Reiser, then in charge of the teaching program in psychiatry. They were constructed on an empirical basis, and the particular items and tests sampled have been changed from time to time as experience and curiosity dictated.

The current booklet consists of materials from seven psychologic tests. The first test sample has five questionnaire items, such

as: "Do you usually sleep well? Have you had a happy childhood? Answer Yes or No." This is followed by five sentence completions, such as: "My family . . . ," "My ambition . . . ." Next are ten word-associations, ranging from "food" to "sex," cursorily covering the range of psychosexual development. A few cards from the TAT follow, then three Rorschach plates. Next, subjects are asked to write down or tell their favorite joke, which is treated as one more projective test. The booklet closes with a blank page upon which they are requested to draw a picture of a person.

It is emphasized that neither the student nor the patient is being given a test in the formal sense of the term; rather, each is dealing with samples of psychologic test data, which could not be interpreted as could a formal test battery.

The entire self-administration of the booklet took 20 to 40 minutes, after which the students were briefed, supported, and sent down to the obstetrics ward to administer the same booklet to women who were awaiting or had just given birth. The women had been visited in advance, and had volunteered to assist as subjects in the training of medical students. An OB population was selected partly because it was available and the department was co-operative, but mainly because the patients were the least ill and the most like a so-called normal population (meaning those who avoid psychotherapy).

After administering the tests, the students were given a written assignment consisting of the following: Write your impressions of the patient, not of her test responses but of her appearance, manner, relatedness, and so forth. In what way do you feel that you are like this patient? In what way are you different? Finally, add any critique, comments or further impressions you may have.

After this first session the groups returned for two further meetings (three, beginning with the fall semester, 1960), during which they discussed the experience, and launched into a brief outline of diagnostic testing.

As can be seen, the tests range from the more structured objective type to the more ambiguous projective ones. This arrangement lends itself particularly well to a discussion of such concepts as structure, set and projection. Another advantage of the exercise is the various levels at which learning takes place. First, there is the actual, immediate experience, with all its excitement, anxiety and expectation. This first encounter is followed by an opportunity to reflect upon the experience and to attempt to make sense out of it. The discussions then offer a conceptual framework into which the experience can be fitted. Finally, there is a further broadening of horizons, with the experience considered in its relevance to psychiatry, to general medical practice and to scientific methodology in general.

The word-associations are treated as internalized representations of the external culture, as well as in their relationship to language and concept formation. Then follows a discussion of how concepts and cognition in general are to be evaluated. Other demonstration materials are interspersed throughout the sessions; for example, several Roger Price "droodles" were presented as illustrations of deviations from the norm which are not necessarily pathologic. This leads to the idea that, in addition to frequency norms, there are objective standards dependent upon certain psychologic principles by which behavior may be understood. In the interpretations, droodles were treated as concepts; this led to a consideration of the relationship between percepts and concepts, and the meaning of such a phenomenon as "F minus" on the Rorschach.

The TAT material is especially helpful in demonstrating how individual differences are expressed in psychologic tests. The stories are treated as communications regarding one's perception of the place of one-

self and others in the world. Figure drawings are handled in a similar manner. After a brief description of the development of form and structure in drawings and other graphic techniques, products are interpreted as a function of the self-concept and of various sexual and social roles, as well as a study in expressive movement. Jokes are treated both as exemplifying many of the principles of projective testing and as representing the vicissitudes of the primary thought process.

Incidentally, the jokes often reflect the student's attitudes, hopes and fears, especially in regard to the role of healer which he will eventually assume. One student told of a man who lost his coat in a restaurant and asked the manager if he had seen anyone leave with a coat of his description. The manager said he had seen only one person leave with a coat. "What kind?" asked the customer. The manager answered, "One that did not fit."

As in the above example, many of the jokes deal symbolically or directly with feelings of inadequacy and fear of "not fitting." Another student told of a man who died and went to heaven, but found there was no record of him in the books. After a long search his name finally turned up. "You must have had a crummy doctor," Gabriel said. "You're not due for another six months."

Some students use the joke question as an opportunity to ventilate anxiety over their forthcoming meeting with the OB patient. One student wrote, "This morning we [doctors] are going to patients strictly to be helped by them." Another commented, "Ye gods, they taught us everything but a bedside manner!"

Anxiety and other attitudes toward the doctor-patient relationship come out with sufficient cogency and directness to appear worthy of a more extended investigation. All of the students' jokes which dealt directly with the doctor-patient relationship, about 25 in all, were culled and compared (for themes and expressions of attitudes, feelings and values) with jokes told by patients in psychiatric treatment. The results indicated many differences between the doctors and the patients. The majority in each group saw the doctor as trying to be helpful but usually not succeeding. In the patients' jokes, treatment failed because of some flaw in the patient.

In the majority of medical students' jokes, however, treatment fails because the doctor is incompetent, or is more concerned with himself than with the patient. For example, a man goes to a specialist who cannot make a diagnosis. "Have you ever had these symptoms before?" the professor finally asks. "Yes," replies the patient. "Aha!" exclaims the professor with an air of finality and great wisdom. "You have it again!" A man in the dentist's chair accidentally swallows a tooth. The dentist sends him to an internist, the internist sends him to a proctologist. The proctologist examines him and says, "My God! You've got a tooth up there. You'd better see a dentist."

One implication of these jokes is that the struggle to define and to fit into the role of a physician is a difficult one, and although the problems may be successfully resolved during the course of the students' general professional experiences, a fuller awareness of what they are struggling with might be a more explicit goal of medical training.

The discussions during the subsequent diagnostic testing seminars are often sharply perceptive. For example, when the instructor compared groups of individual responses as if they were one protocol, the students were quick to point out the fallacies involved. They noted the different conditions and attitudes under which the tests were taken, and speculated upon the effects. They tended to focus more upon situational factors in the beginning and upon dynamic-personal ones later (the defensive character of their resort to objectivity, incidentally, becoming quite clear).

Much personal involvement in learning

sessions to follow. The majority of the students become deeply interested in psychology. Many controversies arise and are settled productively. For example, in a discussion of the "true" meaning of an ink blot, or the "right" interpretation of a TAT picture, the concept of projection becomes more meaningful than any explanation alone could be.

Individual differences in the initial written evaluations are also striking, with some students damning the exercise as a waste of time, and others declaring it a rewarding experience. Some depreciated the assignment: "When I took the test I felt that in a way it was a big joke. I amused myself by peeking over someone's shoulder to see *his* funny answers." Another (perhaps the one over whose shoulder he peeked): "When I took the test I had no feelings that I can remember. I think that after a while our patient considered the test a big joke. Truthfully, I didn't take it too seriously."

Most students wrote positively: "My experiences during the test were rich. The TAT cards were provoking and meaningful to me. I believe that this sort of thing is invaluable." Another: "I enjoyed taking the test, although at times I felt embarrassed when I looked at some of my handiwork, the Human Figure test giving me the most inner dissatisfaction. I found the whole experience quite rewarding in terms of appreciation of the tests used and their effects on the person being tested."

The initial reactions of many students were highly intellectualized: "With a desire to give added meaning to the test, I consciously tried to unconsciously drop my defenses and to give spontaneous, freely associated responses to the questions and pictures." Also: "My own introspective experience, which was rather shallow, shows a definite concern with the oral modes of gratification."

Others reported a sense of surprise or insight: "I looked back and was surprised to find how much of myself was revealed by the few things I wrote." And: "The questions, simple as they were, are the sort of thing students don't have time for in their hurried life. I was therefore slightly surprised at some of my answers and associations."

Some admitted to feelings of anxiety: "I was constantly attempting to write down my first impressions after being torn between what the truth was and what I feared might be read into what I wrote or drew." Another student: "I felt nervous. This was my first contact with a person who I'm sure thought of me as a doctor. I tried to alleviate my anxieties by pointing out to her that she was nervous."

The female students had a more personal interest in the OB patients: "I was very interested in hearing her answers. I was curious about some of her replies and wanted to question further—I didn't. I wanted to know what sex baby she had (I read her arm band finally), how many other children she had, was she glad to have had another baby.... We were both interested in seeing what was coming next."

Many mentioned the uniqueness of the event, this being their first patient: "I enjoyed the entire procedure, largely because she was my first patient, and at no time did I feel ill at ease. [But] my only moment of uncertainty was when I was told I would interview a patient. Taking the same test myself removed any nervousness I might have had if I asked her the questions cold. I will remember the experience forever, because it was one of those medical firsts, one which thankfully enough was assuring."

The value of the experience was indicated by the student who said: "I thought that I had a valuable experience. One reaction —as I heard the patient describe the Rorschach cards in a similar manner I felt humiliatingly normal."

The sensing of one's kinship with the rest of humanity may not be a prominent goal of psychiatric teaching, but it is surely a useful attribute. In this respect this pro-

gram of testing attempts to embody both humanistic and scientific aspects in the teaching of psychiatry.

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The Experimental Analysis of Behavior in the First Psychiatry Course

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This paper will describe a teaching program, part of the psychiatry course at Indiana University, which is an application of principles from the experimental analysis of behavior to problems in clinical and experimental medicine. The course is intended to provide a basic formulation of behavior that would serve as a framework for the clinical problems the medical student will meet later in clinical psychiatry as well as in the other departments of medical science. The course content leans heavily on animal research, and is basic in that it deals with principles of behavior which have biologic generality. During the first year the course consisted of 12 lectures; in the second, it was expanded to 24. In an attempt to experiment with the course content, however, the students were divided into three sections of about 60 each, with three instructors (of whom the writer was one) presenting different subject matter. Dr. Marvin Zuckerman emphasized personality theory and dynamics; Dr. John I. Nurnberger, the departmental chairman, emphasized biochemical, genetic and hormonal factors wherever possible. (Dr. Zuckerman and Dr. Nurnberger will present the contents of their courses elsewhere.)

My course assumed that operant behavior—instrumental behavior—was the prime subject matter of a basic psychiatry course. It considered the general problem of why an organism (man) moves about, talks, and so on; the goal was to present an account of the activity of this organism in the world as he interacts with his environment and as the environment in turn affects his performance. The subject matter was also intended to give the student a framework for the role of specific physiologic factors in the integrative activity of man. Such topics as the Pavlovian conditioned reflex were not emphasized, because they were

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considered to be more appropriate to the physiology course. The reflex system of the organism represented a one-way reaction with the world, similar to a reaction to infection or to a tapping of the knee. Behavior of greater psychologic interest was operant behavior, maintained because of its consequences in the organism's environment. The discussions of the reflex were therefore oriented toward an analysis of the interaction of the reflex and operant repertoires, emphasizing their dynamic inter-reaction.

The second major assumption was that the behavior of an organism is a biologic datum, and that all of its facets are best approached by the most conservative and orthodox techniques of natural science. The datum is fundamentally simple: the movements of the organism involving the striated musculature, as in talking or walking or solving a problem. No matter what the activity, eventually a movement of a striated muscle can be specified and measured. Similarly, the environmental causes are potentially of equal simplicity. These are direct, measurable effects of performances on the environment (reinforcement). What is needed is patently simple, although in practice difficult—a functional relationship between the organism's behavior and its effect on its environment.

The third assumption was that the nervous system was not the most relevant datum in a basic psychology course. Study of the function of the nervous system was an advanced topic which presupposed an ability to describe systematically the environmental control of the behavior of an organism. The central nervous system was not considered to be a unitary cause of behavior, but rather one of the major organ systems which underlie the organism's behavior.

The fourth assumption was that the behavior of an organism was no more complex than any other datum in biology, and that complexity is the antithesis of laboratory analysis. Complex situations are often those which are not analyzed, and there is no innate complexity which is a barrier to natural scientific descriptions of behavior. The course subject matter emphasized those aspects of the behavior of an organism which have already proved amenable to scientific description and which have been brought under laboratory study and control. Rather than a tacit acceptance of the complex case and the unanalyzed sample of behavior as the focus for analysis, the inquiry was reversed: the practical problems in the ecologic world were considered when the operation of laboratory-derived principles could be demonstrated.

Finally, manipulable variables were emphasized. All of the processes described referred to an individual being, whether a pigeon, a monkey or a psychotic person. In addition to the relevance of the processes to an individual, all of the factors considered were manipulable, at least potentially. The course emphasized understanding behavior by identifying factors which are potentially manipulable so as to produce the possibility of control over the performance of the individual.

During the first year of the course, *Science and Human Behavior*, by B. F. Skinner, was used as a textbook, and lecture notes amplified some of this material. Teaching machines which presented the Holland-Skinner psychology program were available to the students, but optionally; these lessons gave the students a technical grasp of the basic principles of behavior. Only about 25 per cent of the students used the teaching machines, even though they were told that the teaching machines would be the most efficient way to study the course material. (The students using the teaching machines earned the highest grades in the course, but it is impossible to prove whether the better students used teaching machines, or the teaching machines improved the students.) In the second year, when the course was expanded to

24 lectures, 61 lessons of the teaching-machine program (approximately 15 to 20 hours of work) were required. The teaching machine could be used in the library or checked out overnight. Now, the teaching-machine lessons were the major subject matter of the course, and no textbook or lecture notes were used. The teaching-machine program was intended to provide a technical grasp of principles of behavior, so that the lectures could deal with the extensions of the basic principles to problems in medical science.

In the lectures the laws of the reflex were discussed, with emphasis on the wide range of conditioned responses. Most of the examples were from Russian research. The basic processes of operant conditioning were covered in detail, including a theoretical comparison of operant and reflex conditioning. The early lectures considered the problems of where behavior comes from and how new forms of behavior arise. Animal demonstrations were used to describe the technique of successive approximation. Live pigeons were trained before the class. In one demonstration, neck stretching was conditioned first, and then the pigeon was required to stretch its neck progressively higher by differential reinforcement. Another demonstration showed a pigeon being conditioned to peck at a key in the classic Skinner-box experiment. Intermittent reinforcement was covered in some detail, and another pigeon demonstration illustrated some of its technical properties. This demonstration also prepared the students for later discussions of some of the applications of these techniques in such areas as psychopharmacology. Another lecture presented a highly technical discussion of the properties of reinforcement, emphasizing its temporal nature, accidental reinforcement, and the broad implications of spurious reinforcement contingencies (superstition). Control of behavior by aversive stimuli, including emotional effects, was discussed broadly. A pigeon was used to demonstrate the effect of preceding an electric shock with a red light. This warning stimulus suppressed the pigeon's food-maintained pecking. This general paradigm of aversive control was extended to the clinical and natural examples of human behavior. Escape and avoidance were demonstrated in a classroom experiment with a monkey.

The teaching-machine lessons provided the technical content of the course; the lectures emphasized discussions of the demonstrations, examples and extrapolations to medical problems and to human behavior. The latter part of the course developed the use of the technical principles of behavioral control in understanding broad problems of human behavior. In the area of growth and development, the previously developed principles were applied to the description of the maturation and development of the child from infancy to adulthood: technical aspects of intermittent reinforcement and successive approximation of a complex response were applied, for example, to the description of weaning a child. The dynamics of a child—for example, how the child teases his parent and how the parent in turn maintains the teasing—illustrated the operation of schedules of intermittent reinforcement in social interactions. One lecture was devoted to private events, a rather abstract and highly technical topic, because behavior that is at least partially under the control of private events is the main area of contact between the patient and his doctor. For instance, the first point of contact between doctor and patient occurs when the latter says, "My shoulder hurts, I feel dizzy, I see spots in front of my eyes," and so on. All of these are responses to events private to the speaker. Private events led to further discussion of the variables controlling the verbal behavior of the patient when he describes his illness. Psychotherapy was discussed, beginning with the general principles of behavior and extending wherever possible to the complex case of the mentally ill person. In the second year of

the course, more topics of medical interest were added. Several lectures were based on the general subject of self-control, particularly in respect to obesity, alcoholism and drug addiction. A general formulation of self-control was developed from the point of view of a functional analysis of behavior. Almost every basic process controlling the behavior of an organism proved to be relevant to analyzing self-control and to indicating some of the ways behavior could be controlled by arranging more efficient self-control. Obesity was discussed in special detail because of the obvious corollary between a person's eating and a pigeon's pecking for food. During one class lecture on psychopharmacology a drug was injected into a performing animal. The experiment showed that behavioral effects of physiologic factors could be measured objectively, and also illustrated the importance of the specific behavioral process involved. The drug was injected into a bird that was performing alternately on two different schedules of reinforcement under the control of two different stimuli, and it affected the two performances differentially. The experiment illustrated the importance of specifying a particular behavioral process.

Three lectures were devoted to a technical discussion of verbal behavior. These lectures in the second year of the course led up to the discussion of private events as given the previous year. With the use of the same terms applicable to other areas of human behavior, the lectures on verbal behavior were an attempt to teach a very complex area of human behavior which the student might not ordinarily consider to be even amenable to rigorous and scientific analysis. Finally, psychosis was treated separately from psychotherapy, with amplification of some of the major principles of behavior as they applied to psychotic behavior and its development.

Many topics were omitted from the course, such as psychologic testing (*e.g.*, intelligence), sensory physiology, sociology, anthropology and genetics. These were considered to be advanced topics, better covered after the student understood the dynamics of why an organism acts in the most simple and fundamental sense. Other areas, such as perception, psychodynamics, attitudes and motivation, were in fact covered, but in a framework different from that used in most courses.

It is difficult to assess the impact of the course on the students because of the strong pressure from neuroanatomy and physiology courses given concurrently with psychiatry. Many of the students complained that the 15 to 20 hours they had to devote to the teaching machines were too many for what they considered to be the relative importance of psychiatry as compared with other subjects in their curriculum. This complaint will probably disappear when the course requirement becomes traditional. Most students (by questionnaire and by personal contact) accepted as relevant to the medical school curriculum the course material and the biologic and functional approach to the study of behavior.

The course in the future should probably be expanded to handle more effectively the students' existing repertoires by finding many more specific problems in medicine which could be analyzed by—or understood better by—reference to behavioral techniques. The major difficulty is the need for some competence in the technical aspects of the experimental analysis of behavior, so that more time and effort can be spent using the principles and techniques of behavioral analysis to solve and clarify those problems in medicine with which the medical student should be concerned. The required use of teaching machines as a major part of the course may well be the solution, in the face of the student's lack of prior preparation and the limited curriculum time.

The Contributions of Psychology to the Beginning Course in Psychiatry

IRWIN J. KNOPF, Ph.D.[1]

For the last several years, some aspect of the teaching of psychology in medical education has been included in the program of the annual American Psychological Association meetings. Interest in this area continues to grow in spite of what may seem at first to be mere embellishments of old problems and content. That this interest continues is not surprising when one considers the recent emphasis on teaching comprehensive medicine, together with the apparent willingness on the part of the medical educators to experiment with modifications and, in some instances, radical changes in the four-year curriculum.

In the last 12 years particularly there has been a ferment among medical faculties seeking to define what knowledge of human behavior—derived from the behavioral sciences of psychology, sociology and cultural anthropology—should be incorporated into the formal educational program of the medical school. The rapidly increasing number of psychologists and other behavioral scientists now functioning in this climate of contemporary medical thought are constantly striving to find more effective ways of teaching the sciences of human behavior as they apply to medicine. The approaches to this problem have been numerous and variable, and it is clear that there is currently little uniformity with regard to such matters as overall philosophy, content, methods of instruction, the many details of time allotment, who will teach the course, and so on. A great interest exists in exchanging information about what others are doing to evaluate critically and to improve teaching programs. In this spirit, this report is a brief description of the freshman course at the University of Texas Southwestern Medical School. (No judgment is made here about its general applicability to other programs.)

As recently as three years ago, the Department of Psychiatry at Southwestern Medical School was reorganized from a part-time to a full-time faculty. During this period a new staff, new facilities and new programs have been acquired and developed. Initially, the freshman course was taught by the Chairman of the Department; as additional personnel arrived, more joint planning and responsibility for undergraduate teaching were possible. The beginning course, given last year, was the result of gradual changes over the last three years, and was the product of collaborative planning and teaching by a child psychiatrist, a sociologist and the writer. The overall philosophy and goals were dictated by the fact that about 80 per cent of the school's graduates become general practitioners in small Texas communities, and also by the fact that the course is offered during the preclinical years of the medical curriculum.

After much review and discussion the three teachers agreed to try to give the beginning student an understanding of human behavior and its relationship to illness by intensive examination of the role and interaction of physiologic, psychologic, sociologic and cultural forces in the formation of personality. Also, from the very beginning, an attempt would be made to increase the student's awareness of the fundamental factors involved in his interactions with his patient, and their therapeutic effects. Essentially, then, the course was planned to cover material which would be basic not only to clinical psychiatry but also to the general practitioner's comprehension of the complex forces that influence man's behavior and well-being.

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With these goals in mind, the collaborators proceeded to touch on some organizational and methodologic considerations. The three instructors would teach various segments of the course, preferably in three sequential blocks of time, and would also be required to attend every class meeting. This would not only increase the continuity and cohesiveness of the teaching but would also broaden the perspective of the sessions, by making possible additional staff discussion of topics from different points of view. Agreement was also reached that the use of small-group discussions, laboratory demonstrations, films and slides, and behavioral illustrations of basic concepts, would be effective supplementary teaching techniques which should be incorporated into the course wherever appropriate and possible.

The total of 24 two-hour class meetings was divided into three blocks of eight sessions, with each instructor responsible for the preparation of one-third of the course. Provisions were made for at least one group discussion session during each block, for which the class was divided into thirds and assigned to one of the three instructors. The instructors were not satisfied with these arrangements, but practical considerations left little choice. During the previous year more frequent group meetings (one a month) and smaller groups (not more than 12 students) had been tried; however, the additional staff required, the conflict of class time with other staff commitments, and the range of content to be covered adequately during the course made more group sessions impractical.

The content of the entire course cannot be covered here in detail. Since this report deals with the contributions of psychology to the beginning course, emphasis will be placed on that third of the course specifically covering this area, with only brief reference to the range of content covered by the other two instructors.

The first eight sessions were prepared by a child psychiatrist, who initially discussed the goals of the course and its requirements, and sketched the history of psychiatry and the behavioral sciences to point up the advances made, and to stress the importance of understanding human behavior in the practice of medicine. The remaining sessions dealt with personality development from infancy to adolescence as formulated by psychoanalytic theory. In the description of the various stages of psychosexual development, emphasis was placed on the major areas of conflict and anxiety, and the implications and consequences of each stage for the structure of basic personality in terms of an increased understanding of the child's behavior. The student was introduced to such concepts as unconscious, id, ego, superego, primary narcissism, identification, introjection, transference and defense mechanisms.

The sociologist focused on social concepts of normality, the dynamics of family organization in American society, social organization and disorganization, and the relation of culture to personality development as illustrated by anthropologic studies of primitive cultures. The student's attention was drawn to the study of competitive, co-operative and conflict behavior in American communities, the concept of social roles, and the effects on personality of group and multiple-group membership. Two of the eight sessions in this block were given by the Department Chairman on maturity and aging, and the biologic aspects of behavior.

The middle block of sessions was devoted to the psychologic forces influencing personality, the topics including physical growth and maturation, learning, forgetting and thinking, intelligence, perception, and emotion and motivation. The beginning session on physical growth was introduced to give the student a view of the newborn as an organism who, in the beginning, is minimally affected by environmental forces, but from this point on is more and more influenced by external factors. Emphasis was

on the presentation of the empirical developmental data concerning physical growth and maturation from infancy through adolescence. Some attention was given to sex differences in growth, as well as to the wide range of individual differences. The meaning of such data and the way they may be interpreted to parents and children were discussed.

The next meeting dealt with the fundamentals of learning, and began with a discussion of the importance of learning and its distinction from maturation. Learning was defined operationally as "the process by which an activity originates or is changed through training procedures, as distinguished from changes not attributable to training." Illustrations of carefully controlled observations and experiments were given to show whether a particular change is primarily the result of maturation or learning (*e.g.*, the Dennis study of the Hopi Indian babies and the McGraw twin study of Johnny and Jimmy). The practical importance of knowing the relative influence of normal growth factors as contrasted with learning was brought home to the student who will, in his later medical practice, be confronted with the questions and anxieties of parents concerning child-rearing practices. This was followed by a discussion of when learning occurs, to stress that, while most learning occurs after birth, there is some evidence to indicate that learning can and does occur in the prenatal period. Studies and observations were presented which showed that learning takes place within a week or so after birth. Next, the principles by which learning occurs were discussed, following mainly the theoretical orientation of Miller and Dollard, in an effort to relate learning theory to the psychoanalytic theory to which the student had been exposed earlier. The student was introduced to the meaning of such concepts as drive (primary and secondary), stimulus, response, reward or reinforcement, gradient of reinforcement, extinction, generalization, anticipatory response, and response hierarchies (initial and resultant). Learned drives were discussed by using the acquisition of fear or anxiety as a detailed example. During this session use was made of apparatus and rats from the animal laboratory to demonstrate experimentally the acquisition of fear. Following this, the instructor illustrated how primary reward serves as the basis for learned rewards by describing how money may acquire reward value in animals and in children. Having so reviewed the basic principles of learning, the instructor could turn to a discussion of how conflicts are learned as exemplified in four basic training situations: feeding, cleanliness, sex training, and the treatment of anger responses in the child.

The next topic was forgetting. The course of forgetting, its relationship to learning, and the factors influencing its rate were discussed. This was followed by presentation of developmental data on language, and a discussion of thinking and understanding. It was pointed out that no two children encounter precisely the same situations, and thus no two children possess a similar background for the interpretation of words and experiences. In addition, emotional attitudes developed in connection with specific life situations vitally affect the meanings attached to experiences, and the language used to denote that experience. The instructor then discussed the early conceptual ideas of children and the immature nature of their beliefs, and traced them to faulty information, inadequate knowledge of words, and such forms of fallacious reasoning as wishful thinking, personal distortion and fantasy. The work of Piaget on language and thought, judgment and reasoning in the child was reviewed.

The nature of intelligence, its growth and decline, its relationship to adjustment, its measurement, and the interpretation of test scores and IQ's were discussed in this next session. Following this, perception, its basis, the way in which it develops through exper-

ence, and the factors which may influence it were treated. During this topical discussion the instructor used slides to demonstrate basic points. For example, the effect of brain injuries on perception as reflected in Bender-Gestalt performance of carefully selected organic patients was illustrated. An attempt was made to demonstrate the effect of strong needs for social approval and conformity on perception by using the autokinetic phenomena.

The final topic was emotion and motivation; the development of emotional reactions in infants and the expected changes in emotion through childhood and adolescence were briefly dealt with. The range of normal reactions in relation to individual differences, sex, race differences, and differences in terms of family background was discussed. The relation of emotion and motivation to attitude, judgment, choice and decision-making, learning and forgetting, perception, and the integration of complex behavior was emphasized.

Some of the reactions of the instructors to the course might be helpful, as well as some of their thoughts about changes for the coming year. In general, the course seemed to have been well received by the students. Feedback by class members indicated that they rated the course as interesting, informative and ultimately useful for their medical practice. The instructors believed that the continuity was enhanced by dividing the course into three sequential blocks, and by the presence of each instructor at every regular class meeting. A certain amount of dissatisfaction with the specific sequence of topics was expressed by the teachers. For example, it was suggested that the session on emotion and motivation should follow the one on physical growth and maturation, rather than come at the end of the psychology block. The instructors discussed and tried to evaluate the usefulness of small-group discussion sessions; they concluded that they were effective, and that attempts should be made to schedule more, perhaps in the form of shorter sessions combined with lectures. The one laboratory demonstration was judged by the students to be highly stimulating and valuable, and ways of including more are under consideration. A psychophysiologic laboratory has recently been completed, and efforts will be made to use this laboratory to demonstrate the effect of emotions on the autonomic nervous system.

The Division of Psychology of the Department of Psychiatry last year began participating jointly with the Department of Pharmacology in their regular course by offering its facilities and personnel to assist in demonstrating to the students the effect of some drugs on behavior. The students were divided into groups of eight: four controls and four experimentals. These students took drugs and placebo in a double-blind design and then measured behavior in terms of such dependent variables as reaction time, discrimination, card-sorting, paired associate learning, and stimulus generalization. This pilot effort was successful as evaluated by the Department of Pharmacology and the medical students, and joint plans to expand our efforts in this direction are under way for the coming year.

This teaching experience has tended to demonstrate that a multidiscipline collaboration in undergraduate medical teaching is not only feasible and gratifying but also essential, if the physician's need for a more comprehensive understanding of man and his behavior is to be realized. The contribution of psychology to this end is and will continue to be substantial, particularly as we gain experience in focusing on the abstraction, integration and implications of psychologic data for the practice of medicine.

Five Introductions to Psychiatry

WILLIAM F. FEY, Ph.D.,[1] ELIZABETH T. FEY, Ph.D.[1] AND RICHARD J. THURRELL, M.D.[1]

Over the last ten years the Psychiatry Department of the University of Wisconsin Medical School has done a great deal of informal experimenting with the format of the introductory psychiatry course. The course has ranged from a traditional lecture series, through lectures supplemented by group discussion sections of varying size and structure, to reliance upon small-group discussions alone. The continuing aim has been to discover a structure which would maximize the chances of significant change in three areas: 1) basic psychiatric knowledge, 2) emphatic sensitivity to clinical material, and 3) attitudes toward psychiatry. Two years ago a formal, experimental program was inaugurated, designed to provide more objective answers to the general question: Which instructional methods maximize various kinds of learning? This paper will describe the work briefly, and then summarize some of the results accruing from it up to the present time.

Traditionally, psychiatric material is taught with primary emphasis upon either the content or the feeling aspects of the subject. With these accepted as the natural poles, a graduated series of teaching situations was devised which would seem to favor, through emphasis, the learning of one of these approaches to psychiatric material, perhaps at the expense of the other. The students were examined before and after the course to measure the extent to which such learning actually occurred, together with the attitudes toward the material which these learning situations engendered.

As the title of this paper implies, five different "introductions to psychiatry" were offered, ranging from highly didactic, information-centered classes at one extreme, to intensely personal, feeling-centered experiences at the other. The actual teaching methods or "options" offered were these: 1) a traditional lecture, clarifying and amplifying the textbook; 2) a group meeting with the instructor, to discuss and ask questions about the textbook; 3) a group meeting with an instructor, to listen to brief recordings of psychiatric interviews and to discuss their implications; 4) a group psychotherapy experience, with freedom to discuss personal feelings and concerns; and 5) an individual psychotherapy experience with a staff therapist.

The site chosen for the experiment was the introductory psychiatry course in the undergraduate medical curriculum. At this point in their training the students' backgrounds are quite diverse: as many as 20 per cent of Wisconsin's students will have had no previous coursework in psychology, whereas half this many may already have had three or more such courses. At the first class meeting these five options were explained fully, and the students were asked to rate each option in terms of its relative appeal as a way of being taught this course. The actual assignment of the students to the various classes was then made, based entirely upon the ratings they had just completed. In 1958 the students were given the teaching approach they most wanted; in 1959 the assignment was essentially random. At this point, too, the students were reassured in the matter of their grades in this course, to allay fear of being put at a disadvantage in this respect. It was explained to them that each student's grade would depend entirely upon his performance in scheduled, information-type examinations. These examinations were in turn based wholly upon the textbook, which all the students were assigned in common. It was explained that, if any group appeared to suffer on these examinations because of

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the manner in which they had been taught, this inequity would be adjusted before final grades were assigned.

The course itself runs 15 consecutive weeks. For each student—no matter what option he is assigned—the total amount of time spent in class is the same (roughly, one hour per week). No student was permitted to attend a class to which he had not been specifically assigned; attendance was firmly encouraged but not officially recorded.

The actual teaching was done by six different persons on the psychiatry staff. No single instructor taught by all five methods; each used only those he felt he could handle most effectively.

As one might suppose, these teaching methods are not equally attractive to medical students as a group. Both years, in advance of classes, the approach most favored by the students was 3) the tape-listening sessions, followed (in order of popularity) by 1) lecture, 2) textbook discussion, 5) individual therapy, and 4) group therapy.

Before classes began, each student had been given a battery of such psychologic tests as the Edwards Schedule, the California F scale and others; some leads therefore appeared as to the personalities of students who strongly preferred certain of these learning situations to others. It must be noted, however, that not all of the descriptions which follow are as yet statistically reliable. Within this study, students who chose the lecture appeared to be mainly timid and passively anxious. Students who asked to discuss the textbook with a staff man emerged as bolder and more demanding of closure than were those attracted to the lectures. Students who sought individual therapy in this course often had an aggressive, self-seeking quality, whereas those who elected group therapy appeared to be tolerant, affiliative and autonomous.

To measure the amount of knowledge or psychiatric information acquired in these various classes, the students were given objective examinations in this area both before and after the course. These examinations were difficult and extensive, and stressed both memory and clinical translation of the material in the textbook. The results in both years have been the same: no teaching group has learned significantly more content than any other. The information-centered groups did no better (or worse) when examined for information than did the therapeutic groups.

The area of empathy or emotional sensitivity was examined to learn if any teaching method appeared to offer the students an advantage over the others. This quality of sensitivity was measured by having the students watch and then make judgments concerning brief movies in which emotional interactions are prominent. (These movies had been previously judged by professional observers who agreed as to which feeling-themes were most certainly present.) When these films were shown to the students, before and following the course, two facts appeared. (These findings, incidentally, relate only to the first year, when the students were taught in the classes they chose; the 1959 results have not yet been fully analyzed.) First, the students who asked for and got individual therapy began by being significantly poorer in sensitivity than the rest of the groups. Second, only one group showed any significant relative improvement in sensitivity at the conclusion of the course (again, the students undergoing individual psychotherapy). This gain was not a statistical artifact, resulting from their poor start; separate samples of students, equally poor at the outset but then taught by other methods, failed to show such improvement.

Finally, to study the students' reactions to these various teaching experiences, they were asked at the conclusion of the course to indicate how well satisfied they were with their weekly sessions. The most satisfied groups were found in individual therapy. Tape-listening, group therapy, textbook dis-

cussion and, finally, lecture followed in that order. This rank order has remained the same in both years, despite different instructors and different methods for choosing the students. This question was also asked: "If you could choose again, knowing what you *now* know of this course, how would you most like to have been taught this course?" Both years there has been a substantial shift away from the information-centered classes and toward the more personal ones. Half of the class would now give individual therapy as its first choice; four months earlier, only one out of five wanted it. Granted that, at this point, it is a riskless choice, still this general migration—away from a safe, passive learning situation toward a more threatening, personal encounter—probably reflects a broader acceptance of the personal relevance and importance of such an experience. This increased acceptance also betrays a strong "rumor effect" operating among the students; to put it bluntly, it is good propaganda to have even a small number of students openly undergoing and responding positively to psychotherapy.

The experience at Wisconsin thus far suggests this course: offering to all students some vivid clinical sample of psychiatric material, plus a series of optional, supplemental experiences, graded to suit the individual student's readiness to examine his own personality dynamics and how these may influence his effectiveness. Granted that this is expensive instruction, it also comes at a precious moment for many students, when a personal, compassionate learning experience may have a lasting and perhaps crucial effect upon their acceptance of the place and value of psychiatry in medical training.

Evaluation in Medical Education: Discussion

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In the history of psychology in medical education there has been much experimentation, though there are not yet demonstratedly effective courses, course content or approaches. Experimental and varying directions at the present stage of development may therefore be the most appropriate form of inquiry and study.

The psychologic climate in medical education today accounts in part for the developments seen, for example, in the introduction of behavioral sciences into medical curricula. The third stage of the development of medical education is now at hand (following the proprietary schools of the nineteenth century, and the basic sciences approach of the last 40 years), where there are both emphasis and support for new methods in medical education. In this period of evaluation and re-evaluation of course content and method, one of the most significant needs may be met by seeking to learn in what ways the teaching of psychology may best be integrated with that done by other basic scientists and clinicians. This is important because the medical student in his training enters with certain orientations and develops others, some of which are reinforced and some not. How, then, may psychology be introduced in so effective a manner that it becomes a part of the medical student's education, congruent with other teaching and not peripheral? One of the major problems in behavioral science education is that the teaching has been parallel but not integrated, so that psychologists, sociologists, anthropologists and other behavioral scientists teach courses each of which offers something, but, in terms of contribution to a unified behavioral science field, essentially is not integrated.

There is also the problem of course con-

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tent. Neither the faculty nor the students themselves have recognized what may be meant by a behavioral science and the need for it. For example, one medical school catalogue (typical of a number of others as well) states: "The requirement for admission to medical school consists of courses which would achieve the following objectives: 1) facility in the use of English, written or spoken; 2) facility in quantitative thinking represented by mastery of at least elementary mathematics; 3) training in physical and biological science to make ready comprehension of medical science and result in a thorough comprehension of scientific method; 4) a foundation of an ever-increasing insight into human behavior, thought and aspiration through study of individual man and his society, as revealed by both the social sciences and the humanities; and 5) some knowledge of a language and culture other than the student's own." This is an excellent series of objectives, but the next paragraph then specifies what is required in terms of courses: "English composition or literature, mathematics, physics, chemistry, zoology, and a classical or modern foreign language." It is difficult to see how a student may achieve these objectives —especially the fourth—through the courses required for admission.

As to the medical school courses, some of the difficulty in teaching behavioral sciences, especially psychology, arises when the goals, objectives and methods have not been defined adequately. Several approaches have been suggested—for example, the Wisconsin experiment (*cf.* Fey), in which five different approaches were organized. Generally reported in many schools are lectures, demonstrations, personal material and experimental methodology. Further, in reviewing the work of medical schools, one is impressed by the historical and local events (perhaps best called accidents) which determine direction, content and approach. Often these historical events and accidents have determined the method and approach. Thus it is important to learn what various school faculties are doing, and if there is some generalizability in the way these events occurred and how they have affected course content.

One of the important problems raised by medical educators is how to motivate students to accomplish the tasks and goals of a course. One way is by experimenting with several approaches and evaluations. The point was made that at Indiana (*cf.* Ferster) the students complained about the deluge of work. Theoretically, if the motivation is adequate, a course in psychology which has a high motivational value will not be perceived as unduly onerous. Still other schools indicate that their primary interest is in teaching skills in clinical practice. One of the more important contributions made by the Wisconsin method is an attempt at evaluation not only of skills and content but also of attitudes. Here, relatively little has been done. This represents an important omission, because psychology faculty members have a special responsibility to be aware of the impact of attitudes upon skills and other behaviors, as areas of investigation where psychology has made notable contributions.

Another dimension has to do with the points raised (Knopf) in the discussion of why psychology is taught the way it is at Texas. For example, Knopf reports data which suggest that about four out of five Texas graduates are going into general practice. This is not unexpected, since a number of State schools attempt to channel their students into general practice because of the needs of the rural areas. Here again, too little has been done in evaluating adequately the career roles of students and designing courses to better assist students toward their career goals. Should there be the same course content for those students —perhaps the majority—who will go into general practice, those who will go into spe-

cialties, and those who will go into academic medicine? The latter have special significance because of the difficulty medicine has had in recruiting academic staff. What psychologists and other faculty members may do to augment the number of students who go into academic medicine and to enhance their teaching characteristics thus has real significance for the future of academic medicine. It would seem that psychology also could contribute here through systematic research.

Finally, evaluation seems to be one of the most important characteristics of any program, so that teaching programs should contain various methods of assessing the teaching through evaluations of content, approaches, methods, goals and accomplishments. Fortunately, there is already available the work of a number of investigators who themselves have taught and who also have systematically applied methods of evaluation to their teaching. Many of the medical schools have attempted ratings of one sort or another, but a review of the rating scales shows that a number are haphazardly thrown together, only a few having been tested in any systematic way. The instructor often prepares the ratings on the spur of the moment, feels happy when students report they like him, and unhappy when they don't. In either event, too often he does not make effective use of the students' appraisals.

Much more attention to evaluation studies is needed. For example, Rimoldi and his group (2, 7), at Loyola University (Chicago), have developed a test of diagnostic skills and systematically studied its utility. Glaser *et al.* (5), at the University of Pittsburgh, have worked with the Tab Item test, another way of evaluating the acquisition of diagnostic skill. Still other examples are the attitudes scale developed by Saslow and Mensh (8); the work of Cowles and Kubany (1) and of Gough (6); and the tests of interviewing skills and attitudes developed by Geertsma and Stoller (3, 4, 9, 10). Fey of Wisconsin reports a similar technique (*cf.* Fey)—films of actual interviews designed to evaluate students' responses based upon their evaluation of the interviews.

The argument has been here advanced that much more attention to evaluation is needed. Accepting this premise, the medical educator has as one of his responsibilities the designing of courses containing built-in ways of evaluating their effects. Such evaluations may well indicate that goals have been reached with respect to the training of general practitioners, but perhaps not with respect to the training of specialists or academic medical faculty. It is desirable to have special ways not only of stimulating students toward one of these three broad goals, but also of evaluating the extent to which these goals have been achieved. Only systematic research can resolve this significant problem of medical education.

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PATTERNS OF PUPILLARY DILATATION AND CONSTRICTION IN PSYCHOTIC ADULTS AND AUTISTIC CHILDREN

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Recently Rubin (8, 9), employing measurements of pupillary reactivity, reported that the so-called functionally psychotic adult is incapable of manifesting an organized response to stress because of a fundamental impairment of function of either the adrenergic or the cholinergic mechanism, or both. The major hypotheses confirmed in the experiments were: 1) Effective adjustments to emergency situations require *maximal* generalized sympathetic response. 2) To attain a maximal level of sympathetic activity in the intact organism, it is necessary not only that increased levels of adrenergic activity follow the emergency, but also that the level of cholinergic activity decrease. 3) The disordered responses to stress that characterize the functional psychoses represent significant departures from the adrenergic increase and cholinergic decrease that characterize the effective, adjusting individual during stress. 4) The varieties of disordered response to stress represent discrete levels of activity of interacting adrenergic and cholinergic mechanism—that is, the disorder may represent an impairment of function of either the adrenergic or the cholinergic mechanism, or both. These interpretations were based upon the findings that either the rate of pupillary dilatation or the rate of constriction, or both, were aberrant in a sample of functionally psychotic patients.

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As the importance of these findings is limited by the size of the sample employed, one purpose of the present study was to ascertain whether the hypotheses could be confirmed on a larger sample. In addition, the members of the sample in the first experiment had been ill for a relatively short period of time, and it was considered important to determine whether the conclusions of the study could be generalized to include the larger population of chronic psychotics. To these ends, 47 psychotic patients who had been institutionalized for an average of 11 years were examined at Warren State Hospital. The sample of normal subjects was also augmented by examining eight additional normal subjects at the hospital.

Another purpose of the present study was to determine the dilatation and constriction response patterns of normal and autistic children and to compare these patterns with those manifested by normal adults. The cross-sectional approach was employed to obtain data that could contribute to an understanding of the fundamentals of ontologic development of autonomic responsiveness in normal subjects as well as psychotics.

METHOD

A physiologic measure of extraocular adrenergic and cholinergic activity was employed in the experiment. The tendency of the pupil to constrict in response to light and the dilatation resulting in the absence of light were employed to measure cholinergic and adrenergic mechanisms, respectively. The cholinergic nature of the activity of the oculomotor nerve under the influence of light has been proved by the positive assay for acetylcholine in the anterior cham-

ber of the eye (2) and the disappearance of the light reflex after the injection of cholinesterase (6). Conversely, the anticholinesterases induce miosis. The work of Pos (7), Hess and Koella (4) and Hess *et al.* (5) on isolated radial preparations of the iris demonstrated contraction in response to small concentrations of adrenalin and noradrenalin. Since these substances are believed to be responsible for neurohumoral transmission in sympathetically innervated structures, the authors considered it reasonable to assume that a dilator muscle existed that responded to sympathetic excitation. In addition, Frohlich and Loewi (3) had shown that the mydriasis induced by adrenalin is intensified by cocaine (an amine oxidase inhibitor).

Since pupillary constriction had been shown to be dependent upon the liberation of acetylcholine, and dilatation upon an adrenergic mediator, the present study employed measurements of rate of dilatation as representing the kinetics of an extraocular adrenergic mechanism, and the rate of constriction as indicative of the kinetics of an extraocular cholinergic mechanism. To this end, measurements were made of the rate of dilatation of the pupil in darkness and the rate of constriction of the previously dark-adapted pupil in the presence of light on normal and psychotic adults and on normal and autistic childen.

APPARATUS

The essential item of apparatus was a Grass camera fitted with a 150 mm. lens and an electronic flash, which was employed to photograph the pupil. Three electronic timers accurate to 0.001 sec. and appropriate relays were used for the automatic, systematic variations of the durations of exposure of the eye to a constant light intensity and to the amount of time spent in darkness. Each subject sat at a table with his head in a head-rest to which was attached a millimeter ruler that could be positioned in the same focal plane as the subject's right eye. The distance between the eye of the subject and the lens of the camera was 56.75 cm., and the distance between the eye and a fluorescent 2 by 2 mm. fixation point mounted slightly below the lens was 65.6 cm. Attached to the base of the camera was a 75 W Mazda lamp that was employed to light-adapt the subject's eye at a constant intensity of 38.59 ft. candles. All measurements were made in a light-tight room.

PROCEDURE

To obtain the rate of dilatation for each subject, the following procedure was employed: After the subject was seated with his head positioned in the head-rest, the room light was extinguished. After 5 sec. in the dark, the intense adapting light was focused on the subject's right eye for 10 sec. At the termination of this interval a photograph of the maximally constricted pupil was automatically taken. This was done twice, in an effort to equate for previous conditions of adaptation of the retina. Each subsequent photograph of the pupil was taken after the subject had been dark-adapted for a prescribed interval of time following maximal constriction. The intervals of dark adaptation employed were 5, 10, 15, 30, 45 and 60 sec.

The procedure employed to obtain measurements of the rate of pupillary constriction was initiated soon after measurements of pupillary dilatation had been obtained. Each photograph of the pupil was taken after the subject had been light-adapted for a specific interval of time following maximal dilatation. The intervals of light adaptation employed were 1, 2, 3, 4 and 5 sec. Prior to measurement of constriction at each of these intervals, the eye was light-adapted for 10 sec. at a constant intensity before it was permitted to dilate maximally within the 60-sec. dark-adaptation period.

EXPERIMENT 1

An attempt was made to confirm the results of an earlier experiment in which 15

normal subjects were compared to 24 functionally psychotic patients at the Eastern Pennsylvania Psychiatric Institute. The experiment now to be described was conducted at Warren State Hospital upon 47 patients diagnosed as functionally psychotic by the psychiatric staff, and upon eight normal volunteers.

SUBJECTS

Measurements of pupillary dilatation and constriction were obtained on eight white control subjects (five males and three females) between the ages of 22 and 40 years. The sample of functionally psychotic subjects consisted of 26 white males and 21 white females, all between the ages of 22 and 40 years, who had been institutionalized for an average of 11 years (from three to 28 years). All of the patients had been diagnosed as schizophrenic reaction of one of four types: simple, hebephrenic, catatonic or paranoid. The patients had received a variety of somatotherapies and psychotherapies during their illness. Medical and routine laboratory examinations revealed the patients to be in good physical health. Seventy-two hours prior to the taking of measurements, all chemotherapeutic regimens were discontinued for those patients who had been on medication.

RESULTS

Comparison of Results Obtained for Dilatation and Constriction on Two Independent Samples of Normal Subjects.

The measurements obtained from the sample of eight normal controls measured at Warren State Hospital were compared to the sample of 15 control subjects measured previously at the Eastern Pennsylvania Psychiatric Institute. The purpose of the comparison, in addition to augmenting the size of the total control group in the series of experiments, was to ascertain the reliability of this method of measuring peripheral autonomic reactivity. If the two samples of control subjects are assumed to be random samples from a normal population, then no significant differences should obtain between the groups with respect to the rate of dilatation or constriction, and the data of both samples could be combined to evaluate dilatation and constriction of the psychotic patients. To this end, an analysis of variance was performed on the amount of dilatation (in millimeters) after each interval in darkness (5, 10, 15, 30, 45 and 60 sec.) for each subject in each of the two normal samples. Similarly, an analysis of variance was performed on the amount of constriction (in millimeters) as a function of the length of time (1, 2, 3, 4 and 5 sec.) the 60-sec. dark-adapted eye was stimulated by a light of constant intensity. The results of the statistical analysis are presented in Table 1. As no significant difference was obtained for the between-groups variance or the interaction between groups and intervals during dilatation and constriction, it may be concluded that the two normal samples were selected at random from the same population. Consequently, the sample values were pooled to yield an augmented normal sample consisting of 23 persons.

Comparisons Between Normal Subjects and Psychotic Patients.

Dilatation:

As previously indicated, the diameter of the pupil following each interval of darkness (*i.e.*, 5, 10, 15, 30, 45 and 60 sec.) was obtained for each control subject and patient. Then, to determine the extent of dilatation between the fifth and sixtieth seconds, independent of individual differences in the final level of dilatation attained, the following measurement was employed: The initial level of dilatation (mm.), D_I, was subtracted from the final level of dilatation (mm.), D_f, and divided by the final level of dilatation. The ratio obtained for each control subject and each patient is presented

TABLE 1

Summary Analysis of Variance of the Rate of Dilatation and the Rate of Constriction Between Two Groups of Normal Subjects

Source of variation	Dilatation				Constriction			
	df	Sums of squares	Mean squares	F	df	Sums of squares	Mean squares	F
Between-subjects	22	69.71			22	11.87		
Between groups (G)	1	1.60	1.60	1.02	1	0.05	0.05	—
Error (b)	21	68.11	1.57		21	11.92	0.49	
Within-subjects	115	32.33			92	15.52		
Between intervals (I)	5	28.99	5.80	193.33*	4	13.76	3.44	172.0*
Between I × G	5	0.19	0.04	1.33	4	0.10	0.02	1.0
Error (w)	105	3.15	0.03		84	1.66	0.02	
Total	137	102.04			114	27.39		

* <.01.

in Table 2, together with the mean, standard deviation and range of values obtained for the control subjects.

If the total sample (N = 23) of healthy subjects employed in the experiments is assumed to be a random sample from a population with a normal distribution for the obtained ratio, then the sample mean, as an unbiased estimate of the population mean, may be employed to determine the likelihood of obtaining for the ratio values which deviate significantly in the direction of excessive or deficient dilatation.

First, a graphic test was performed to determine the normality of the distribution (1) of the dilatation ratio. In this test rankits were plotted against their corresponding variates, and it was readily apparent that a straight line could be fitted by inspection. This strongly suggested that the sample of dilatation ratio scores was distributed normally. One could now make inductive inferences from the sample with a reasonable degree of assurance.

A determination was then made of the area under the normal curve between two points or scores that gave the relative frequency with which cases fell between the scores. It was found that 96.42 per cent of the area of the normal curve was between X = 0.144 and X = 0.244. Therefore, the probability of obtaining a value equal to or less than 0.144 is 0.018, and the probability of obtaining a value equal to or greater than 0.244 is also less than .02. Values of the dilatation ratio for patients that fell beyond the interval 0.144 to 0.244 have been marked with an arrow in Table 2. The direction of the arrow indicates whether the value of the ratio is significantly less than (←) the lowest fiducial value within the normal range, or greater than (→) the highest value within the normal range for dilatation. All unmarked ratios fall within the limits for normal values. The average value was obtained for those *Ss* who demonstrated less dilatation than did the normal *Ss*, as was the average value for those *Ss* who demonstrated greater dilatation. The significance of the difference between the mean value of each of the two groups as contrasted with the mean value of the control *Ss* was determined by means of the *t*-test. The results of the analysis are presented in Table 3. The mean values of the groups of patients categorized on a basis relative to the probability limits of normal values for the extent of dilatation were, as expected, significantly different from the mean value of the control

TABLE 2

Extent of Pupillary Dilatation and Constriction† in Normals and Psychotics*

Normals			Psychotic Patients		
Subject	Dilatation	Constriction	Subject	Dilatation	Constriction
1	0.154	0.310	1	←0.137	0.567→
2	0.182	0.269	2	0.198	0.435→
3	0.171	0.177	3	0.262→	0.486→
4	0.216	0.302	4	←0.135	0.405
5	0.242	0.403	5	←0.111	0.211
6	0.187	0.376	6	0.282→	0.188
7	0.207	0.206	7	←0.071	0.201
8	0.205	0.238	8	←0.081	0.272
9	0.165	0.372	9	←0.070	0.308
10	0.208	0.260	10	←0.108	0.400
11	0.181	0.199	11	0.262→	0.427
12	0.229	0.359	12	0.161	0.759→
13	0.203	0.243	13	←0.064	0.337
14	0.226	0.222	14	←0.087	0.247
15	0.226	0.320	15	←0.042	0.169
16	0.214	0.313	16	0.168	0.474→
17	0.174	0.331	17	0.209	0.495→
18	0.161	0.319	18	0.173	←0.071
19	0.178	0.271	19	←0.104	0.489→
20	0.198	0.360	20	←0.143	0.341
21	0.183	0.357	21	←0.071	←0.045
22	0.160	0.222	22	←0.100	0.512→
23	0.183	0.388	23	0.270→	0.287
			24	0.229	0.443→
Range	(0.154-	(0.177-	25	←0.138	0.290
	0.242)	0.403)	26	0.283→	0.348
Mean	0.194	0.296	27	0.254→	0.341
S.D.	0.024	0.067	28	0.199	0.432→
			29	←0.124	←0.137
			30	←0.131	0.669→
			31	0.157	0.442→
			32	0.180	←0.119
			33	0.174	0.614→
			34	0.227	1.014→
			35	0.249→	0.197
			36	0.296→	0.618→
			37	←0.117	0.586→
			38	0.206	0.461→
			39	0.251→	0.336
			40	0.265→	0.472→
			41	0.260→	0.751→
			42	0.283→	0.369
			43	0.165	0.525→
			44	0.298→	0.284
			45	0.297→	0.255
			46	0.249→	0.663→
			47	0.269→	0.383

* Extent of Dilatation = Final Level (mm.)—Initial Level (mm.)/Final Level (mm.).

† Extent of Constriction = Initial Level (mm.)—Final Level (mm.)/Final Level (mm.).

group ($p < .001$ for each comparison). The results therefore indicated that the members of the patient group fell into any one of three discrete groups with respect to extent of dilatation. One group showed the same extent of dilatation as did the normal controls (13/47); another group showed excessive dilatation (16/47); the third group showed deficient dilatation (18/47). These relationships are presented in Figure 1. In this figure the values of the ordinate D_f-D_t/D_f consist of the final level of dilatation (mm.), D_f, the extent of dilatation after 60 seconds in darkness, minus the level of dilatation after each interval in darkness, D_t, divided by the final level of dilatation, D_f, and the abscissa represents the intervals of darkness in seconds, t, preceding photographing the pupil. To calculate this ratio, the mean value at each interval for each group was employed. Each of the relationships plotted therefore represents a rate of increase of pupil diameter. The results clearly indicate the three distinct rates of changes which characterize the sample of patients in the experiment. The hypothesized three distinct levels of dilatation seem to have been confirmed.

To determine the comparability of the frequency distributions for the three categories between the patients tested at the Eastern Pennsylvania Psychiatric Institute and Warren State Hospital, a chi-square test was performed and yielded a value of 2.61, which for 2 df is not significant. The hypothesis that the frequency distribution in the three categories is independent of the two samples was therefore accepted.

Constriction:

The diameter of the 1–min. dark-adapted pupil of the eye was obtained following exposure to a constant intensity which lasted for 1, 2, 3, 4 or 5 sec. These measurements were obtained for each control *S* and patient. To determine the extent of constriction of the pupil of the dark-adapted eye

TABLE 3

Comparison Between Controls and Patients with Respect to Extent of Dilatation and Constriction

	Dilatation			Constriction		
	Patients		Controls	Patients		Controls
	Defective	Excessive		Defective	Excessive	
Mean	0.102	0.271	0.194	0.093	0.567	0.296
N	18	16	23	4	21	23
s^2	0.0009	0.0003	0.0006	0.0018	0.0206	0.0044
t	10.8	10.8		5.36	5.89	
p	<0.001	<0.001		<0.001	<0.001	

between the first and fifth seconds, independent of individual differences in final level of constriction attainable, a derived measure was used for each *S*. To avoid negative values, the final level of constriction (mm.) was subtracted from the invariably greater initial level (mm.) and then divided by the final level. The ratios obtained for the controls and patients are presented in Table 2, together with the mean, standard deviation and the range of values obtained for the control *Ss*.

If it could be demonstrated that the constriction ratios for the sample of control subjects were distributed normally, then the sample mean could be employed to determine the likelihood of obtaining values for the ratio which deviated significantly in the direction of excessive or deficient constriction. The graphic test for normality of distribution suggested by Bliss and Calhoun (1) was again employed to determine the normality of the sample distribution of the constriction ratio. The rankits were plotted against their corresponding variates and an obviously straight line was fitted by inspection. This strongly suggested that the sample of scores was distributed normally, and that inductive inferences from the sample could be made with a reasonable degree of assurance. It was found that 95.44 per cent of the area of the normal curve was between the scores, X = 0.162 and X = 0.430. The probability of obtaining a value equal to or less than 0.162 was 2.28 per cent,

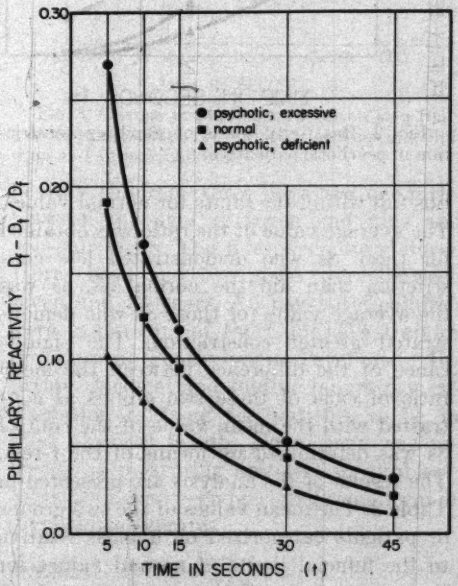

FIG. 1. Reactivity levels of pupillary dilatation in psychotic patients.

and the probability of obtaining a value equal to or greater than 0.430 was also less than 3.0 per cent. Values of the constriction ratio for patients that fell beyond the interval 0.162 to 0.430 have been marked with an arrow in Table 2. The direction of the arrow indicates whether the value of the ratio is significantly less than (←) the lowest fiducial value calculated for the normal sample, or greater than (→) the highest value within the sample. All unmarked ra-

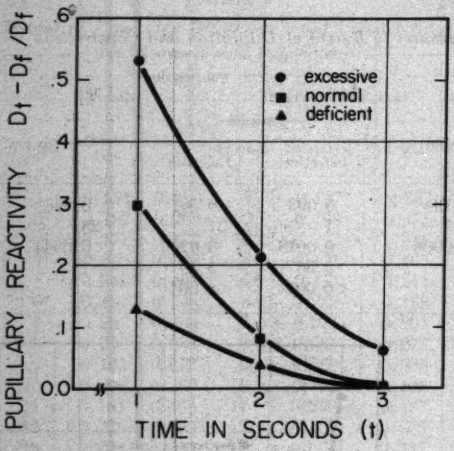

FIG. 2. Reactivity levels of pupillary constriction in psychotic patients.

tios fall within the limits for normal values. The average value of the ratio was obtained for those *Ss* who demonstrated less constriction than did the normal *Ss*, as was the average value for those *Ss* who demonstrated greater constriction. The significance of the difference between the mean ratio of each of these two groups as contrasted with the mean value of the control *Ss* was determined by means of the *t*-test. The results of the analysis are presented in Table 3. The mean values of the two groups of patients categorized on a basis relative to the fiducial limits of normal values for the extent of constriction were, as expected, significantly different from the mean constriction ratio value of the control group ($p < 0.001$ for each comparison). The results therefore indicated that the members of the patient group fell into one of three discrete groups with respect to the extent of constriction. One group showed the same extent of constriction as did the normal controls (22/47); another group showed excessive constriction (21/47); the third group showed defective constriction (4/47). These relationships are presented in Figure 2. The average values for each interval within each category of constriction were employed to determine the ratio, D_t-D_t D_t, where D_t represents the average diameter (mm.) of the constricted pupil at each interval of time (secs.), t. This ratio is plotted on the ordinate in Figure 2 as a function of duration of exposure in seconds, t, to a constant intensity of light. Thus, each relationship represents the decrease in pupil size as a function of time. Three distinct rates of change are illustrated in the figure. The asymptote for constriction was realized in each of the three groups following exposure to a constant intensity light source for four seconds. When the curve for those patients showing defective constriction is compared to the curve representing normal constriction, it is found that the amount of constriction per unit time is less. Those who are described as manifesting an excessive tendency toward constriction show significantly more pupillary constriction than does the normal group as a function of time. With respect to constriction, therefore, three levels (each significantly different from the other) were found in the sample of patients employed in this study, confirming the results obtained in the previous study. Approximately 47 per cent of the patients showed no impairment in constriction, 45 per cent showed excessive constriction, and 8 per cent were found to be defective in construction.

A chi-square test was performed to determine whether the frequencies in the three categories obtained on this sample of patients tested at Warren State Hospital were comparable to the frequencies for each of the three categories previously obtained on the sample measured at the Eastern Pennsylvania Psychiatric Institute. An analysis of the contingency table resulted in a chi-square equal to 3.12. For 2 df, a chi-square equal to or greater than 5.99 is required to reject the hypothesis of independence between the categories at the .05 level of confidence. It may be concluded that the dis-

tribution of frequencies in the three categories of constriction was independent of the samples employed.

The Interaction of Dilatation and Constriction:

The results of the preceding sections confirmed earlier results that had established the existence of varieties of levels of dilatation and constriction. An extension of the hypotheses was concerned with the matrix of defective steady-states characteristic of the varieties of the so-called functional psychoses. Thirteen out of 47 psychotic patients showed no impairment in the extent of dilatation (Table 2). However, *all* of the members in this group manifested *aberrant* constriction. Eleven of the 13 manifested excessive constriction, while two were deficient. Conversely, of the 22 *Ss* out of the 47 who showed no impairment in constriction, *all* were aberrant in the extent of dilatation; 11 had less dilatory tendency, and 11 had more than the controls. Or, in confirmation of the previous study, it may be stated that *all 47 patients in the study showed a significant impairment in the tendency either to dilatation or to constriction, or both.*

EXPERIMENT 2

The second experiment was designed to determine the dilatation and constriction response patterns of normal and autistic children, and to compare these patterns to those manifested by normal adults. The results of such preliminary experimentation, it was felt, might contribute to an understanding of the fundamentals of ontologic development of autonomic responsiveness in normal *Ss*, as well as ascertain whether autonomic dysfunction is also a concomitant of childhood psychosis.

SUBJECTS

The data in this second experiment were obtained from four apparently normal, healthy children (three boys and one girl), between the ages of seven and nine and one-half years. The five psychotic children (three boys and two girls) were between seven and 12 years. All psychotic children were in-patients of the Children's Unit of the Eastern Pennsylvania Psychiatric Institute. Medical and routine laboratory examination revealed the patients to be in good physical health. No patient was reported as presenting any feeding problem. All patients had been receiving some form of psychologic therapy.

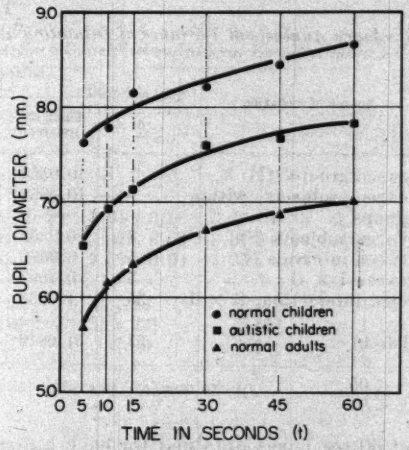

FIG. 3. Change in pupillary dilatation as a function of time in dark for normal adults, normal children and autistic children.

METHOD

Measurements of pupillary dilatation and constriction were obtained on the nine children, using the apparatus and procedures previously described to measure pupillary reactivity of adults.

RESULTS

Comparison Between Autistic and Normal Children.

Dilatation:

The diameter of the pupil following each interval of darkness (*i.e.*, 5, 10, 15, 30, 45

TABLE 4

Summary Analysis of Variance of Dilatation and Constriction Between Normal and Autistic Children

Source of variation	Dilatation				Constriction			
	df	Sums of squares	Mean squares	F	df	Sums of squares	Mean squares	F
Between groups (G)	1	10.0553	10.0553	6.59*	1	2.0239	2.0239	3.85
Between subjects within groups	7	10.6802	1.5257		7	3.6835	0.5262	
Between subjects (S)	8	20.7355			8	5.7074		
Between intervals (I)	5	9.0460	1.8092	39.50†	4	13.8976	3.4744	175.47†
Between I × G	5	0.3092	0.0618	1.35	4	1.7838	0.4459	22.52†
Pooled interaction: S × I	35	1.6033	0.0458		28	0.5567	0.0198	
Total	53	31.6940			44	21.9455		

* <.05.
† <.01.

and 60 sec.) was obtained for each autistic and each normal child. The average pupil diameter at each interval for the autistic and normal children is presented in Figure 3. An analysis of variance of pupil diameter (mm.) following each interval of darkness was performed to determine whether a significant difference obtained between group means and group slopes. The results of the analysis are presented in Table 4. The significance of the between-groups variance ($p < .05$), and the insignificant interaction between groups and intervals (I × G), indicate that the slopes of the groups are parallel and equal, but that the absolute level of dilatation is greater for the normal children. It may be concluded that there is no significant difference between the groups with respect to the rate of pupillary dilatation, but that the absolute level of dilatation of normal children is significantly greater than that of autistic children.

Constriction:

The diameter of the pupil following each interval of light stimulation (*i.e.*, 1, 2, 3, 4 and 5 sec.) of the 1-min. dark-adapted eye was obtained for each normal and each autistic child. The average value for each group at each interval is presented in Figure 4. An analysis of variance of pupil diameter following each interval of light stimulation is presented in Table 4. The significant interaction of groups and intervals (I × G), ($p < .01$) indicates that the group slopes differed significantly—that is, the rate of pupillary constriction in normal children was found to be significantly greater than that in autistic children. An additional analysis of the difference between group means at each interval employing the *t*-test (Table 5, line 1) established that the

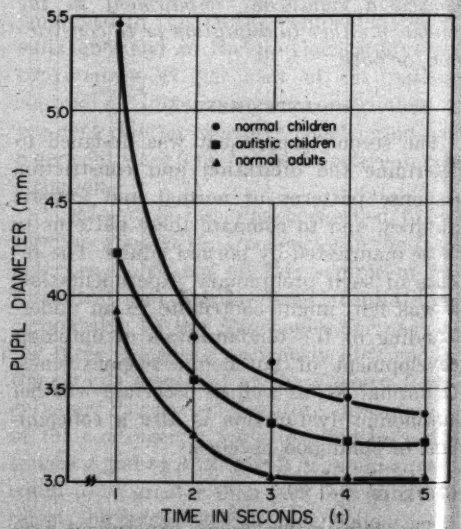

FIG. 4. Change in pupillary constriction as a function of duration of light adaptation for normal adults, normal children and autistic children.

TABLE 5

*Summary Table of Comparisons Between Group Means at Each Constriction Interval Employing the t-Test**

Group	N	Intervals (secs.)									
		1		2		3		4		5	
		$\bar{X}$	s^2	$\bar{X}$	s^2	$\bar{X}$	s^2	$\bar{X}$	s^2	$\bar{X}$	s^2
Normal children (NC)	4	5.46	0.29	3.76	0.29	3.64	0.36	3.45	0.13	3.36	0.07
Normal adults (NA)	23	3.91	0.20	3.25	0.13	3.02	0.09	3.01	0.09	3.01	0.09
Autistic children (AC)	5	4.23	0.08	3.54	0.02	3.32	0.04	3.23	0.04	3.21	0.05
(1) t NC-AC		4.41‡		0.89		1.13		1.17		0.94	
(2) t NC-NA		6.11‡		2.46†		3.22‡		2.58†		2.16†	
(3) t NA-AC		1.51		1.77		2.00		1.50		1.37	

* The mean ($\bar{X}$) and variance (s^2) are presented at each interval for each group.
† <.05.
‡ <.01.

TABLE 6

*Summary Table of Comparisons Between Group Means at Each Dilatation Interval Employing the t-Test**

Group	N	Intervals (secs.)											
		5		10		15		30		45		60	
		$\bar{X}$	s^2	$\bar{X}$	s^2	$\bar{X}$	s^2	$\bar{X}$	s^2	$\bar{X}$	s^2	$\bar{X}$	s^2
Normal children (NC)	4	7.62	0.11	7.79	0.18	8.16	0.12	8.23	0.22	8.45	0.18	8.65	0.25
Normal adults (NA)	23	5.68	0.41	6.15	0.62	6.35	0.55	6.72	0.61	6.87	0.51	7.02	0.60
Autistic children (AC)	5	6.52	0.19	6.93	0.26	7.14	0.38	7.60	0.41	7.67	0.51	7.82	0.48
(1) t NC-AC		(See Table 4 and Fig. 4)											
(2) t NC-NA		5.83‡		4.04‡		4.74‡		3.71‡		4.24‡		4.01‡	
(3) t NA-AC		2.77‡		2.11‡		2.22†		2.35†		2.28†		2.13†	

* The mean ($\bar{X}$) and variance (s^2) are presented at each interval for each group.
† <.05.
‡ <.01.

significant interaction is the result of a significant difference between means at 1 sec. only, after which time no significant differences obtain. The probability level for each comparison between group means at 2, 3, 4 and 5 sec. was greater than .20. Therefore, although the rate of constriction was seen to be greater for the normal children, the absolute level of constriction was found to be the same for both groups.

Comparisons Between Normal Children and Normal Adults.

Dilatation:

The diameter of the pupil following each interval of darkness (*i.e.*, 5, 10, 15, 30, 45 and 60 sec.) had been obtained for each normal child and normal adult. The average pupil diameter and the variance at each interval for each group are presented in Table 6. The *t*-test was employed to determine whether the group means differed significantly at each interval, and the results of the comparisons are presented in line 2. The *t*-value for the mean differences at each interval is significant at the less than .01 confidence level. As the mean pupil diameter at each interval for the children is greater than that of the adults, it may be concluded that the absolute level of dilatation of the normal childen is significantly greater. Figure 3 depicts the relationship of

the mean pupil diameter (mm.) as a function of time in darkness (sec.) for the normal children and the normal adults.

Constriction:

The diameter of the pupil following each duration of light stimulation (*i.e.*, 1, 2, 3, 4 and 5 sec.) of the 1-min. dark-adapted eye had been obtained for each normal child and normal adult. The average pupil diameter and the variance at each interval for each group are presented in Table 5. The *t*-test was again employed to determine whether the group means differed significantly at each interval, and the comparisons are given in Table 5, line 2. At each interval it was found that the mean pupil diameter for the normal adults was significantly smaller than that for the children—that is, the normal adults manifested significantly more constriction at each interval. However, although the absolute level of constriction was consistently greater for the normal adult, examination of Figure 4 indicates that the rate of constriction was significantly greater for the normal child. Thus, normal children manifest more rapid constriction than do adults, but the absolute level of constriction is significantly greater in normal adults.

Comparisons Between Autistic Children and Normal Adults.

Dilatation:

The diameter of the pupil following each interval of darkness (*i.e.*, 5, 10, 15, 30, 45 and 60 sec.) had been obtained on each of the normal adults and each autistic child. The mean pupil diameter and the variance at each interval for each group are presented in Table 6. The *t*-test was employed to determine whether the group means differed significantly at each interval, and the *t*-value for each comparison is presented in Table 6, line 3. At each interval the mean difference is significant at the less than .05 level of confidence. Consistently, the mean pupil diameter at each interval for the autistic children is significantly greater than the average value for the normal adults. The functional relationship between pupil diameter and time spent in the dark (sec.) for each of the groups is presented in Figure 4. As the slopes of the curves appear to be equal and parallel, it may be concluded that the level of dilatation for autistic children is significantly greater than that for normal adults. It should be emphasized, however, that the results of a previous comparison indicated that the normal child manifested significantly greater dilatation than did the autistic child.

Constriction:

The diameter of the pupil following each period of light stimulation (*i.e.*, 1, 2, 3, 4 and 5 sec.) of the 1-min. dark-adapted eye had been obtained for each normal adult and each autistic child. The mean pupil diameter and the variance at each interval for each group are presented in Table 5. The significance of the difference between group means at each interval, as determined by means of the *t*-test, is presented in Table 5, line 3. No significant difference obtained between group means at any of the intervals. The autistic children, it may be concluded, did not differ from normal adults with respect to either rate of constriction or absolute level of constriction, whereas it will be recalled that normal children manifested more rapid constriction than did the normal adults, whose absolute level of constriction was greater.

DISCUSSION

An earlier paper (8) developed a theoretical framework that characterized the functional psychoses as chronic disordered autonomic steady states. Measurements of pupillary dilatation and constriction were employed to test the specific hypotheses that autonomic activity of the local extraocular system was different in normal *Ss* at rest and under stress, and that the func-

tionally psychotic manifested aberrations of either pupillary dilatation or constriction or both. In support of the hypothesis that the functional psychoses were characterized by atypical extraocular autonomic responsiveness to stress, it was demonstrated that the psychotic sample manifested three distinct levels of dilatation and three significantly different levels of constriction. The major hypothesis—that the disordered autonomic activity of the extraocular motor system in functional psychoses represents significant departures from the increased pupillary dilatation and decrease in pupillary constriction of the effective, adjusting individual during stress—was confirmed when it was found that *all* of those patients who showed no impairment in the extent of dilatation demonstrated impairment in the rate of constriction, and that *all* of those patients who showed normal constriction manifested impairment in dilatation.

The results of the present study, based upon 47 adult patients, completely corroborated the above findings previously reported on 24 patients. But it is felt that the nature of the replication of the study contributes more than increased assurance in the reliability of the measurements obtained. Performing the present study at another hospital permitted several factors to exert their influence on the measurements which could have obfuscated the consistent results previously reported. That they did not do so suggests that they were not relevant to the biologic parameters. For example, although the *Ss* in both samples were diagnosed by competent clinical staffs as functionally psychotic, the patients at Eastern Pennsylvania Psychiatric Institute had been ill for much shorter periods of time than had the patients at Warren State Hospital. Not only did the patients differ with respect to length of illness, but broad differences in sociocultural background were also undoubtedly present: the Eastern Pennsylvania Psychiatric Institute serves the needs of a vast metropolitan urban area, while Warren State Hospital serves the needs of agricultural, rural communities. Other differences could also be found in the diet and in sanitary conditions between an institution providing care for 200 patients and one serving from 4000 to 6000 patients. Yet, although these factors were permitted to remain operative, the results of the present study completely substantiated the earlier findings.

Whereas the first experiment was concerned with demonstrating that pupillary reactivity could be employed to determine the existence of the discrete patterns of pupillary dilatation and constriction in a population of functional psychotic patients, the second experiment investigated the ontologic development of dilatation and constriction in normal individuals. It was found that normal children manifested significantly greater dilatation than did normal adults. In addition, the children responded with a greater rate of constriction, although the absolute level of constriction was greater for the normal adult. These results strongly suggest that children and adults are significantly different with respect to autonomic responsiveness. And although the intermediate biologic-chemical factors are not as yet known, it would seem that the normal child as he develops into a normal adult undergoes some changes, possibly hormonal, that reduce the level of dilatation, decrease the rate of constriction but increase the absolute level of constriction.

A major aim of the second experiment reported was the determination of whether there were significant differences in the autonomic activity of the local extraocular motor system between normal and autistic children. The results clearly indicated that normal children manifested a greater level of dilatation, and that, while they were indistinguishable from the autistic children with respect to the absolute level of constriction, the rate of constriction was greater for the normal children.

Although the autistic children manifested less dilatation than did the normal children, they showed significantly greater dilatory activity than did the normal adults. Furthermore, whereas normal children and normal adults differed significantly with respect to constriction, no significant difference obtained between autistic children and normal adults with respect to either the rate of constriction or the absolute level of constriction.

The results of these studies indicate that functionally psychotic adults and autistic children have as a concomitant of their illness a clearly defined peripheral autonomic dysfunction. That the adult psychotic may be classified into discrete categories of dilatation and constriction throws reasonable doubt upon the current quest for a single chemical panacea for a disease state that is apparently heterogeneous. The more logical alternative proposed is that each pattern of adrenergic-cholinergic activity may require a specific combination of drugs which differentially affect the level of activity of either or both components of the autonomic nervous system.

The elaboration of a pattern of peripheral autonomic dysfunction in autistic children, and the specification of the differences in these patterns between normal adults and normal children by means of measurements of pupilary reactivity, suggest the need for additional studies in the ontology of autonomic responsivity.

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A METHOD FOR EVALUATING DISABILITY IN PATIENTS WITH PARKINSON'S DISEASE

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Interest in the accurate evaluation of patients with Parkinson's disease has markedly increased in recent years, coincident with progress in the medical and surgical therapy of this disorder. Although the basic diagnostic procedures in Parkinsonism are not difficult, detailed information is often necessary to treat such patients safely and adequately. Isolated measurement of the cardinal manifestations of the disease is useful in understanding its pathophysiology. However, from the clinical standpoint it is even more important to view the patient in terms of impact of the neuromuscular disorder on his ability to cope with the conditions of daily life.

The need for a valid and reliable method for making this important determination was first recognized by England and Schwab (1). These investigators evaluated 26 post-surgical Parkinsonian patients with an "objective" and a "subjective" scale. The former was based on the impression of the examiner concerning such areas as locomotion, manipulation, rigidity and tremor. The disagreement between clinicians never exceeded five per cent. Reliability studies were not carried out on the subjective scale, which was completed by the patient himself. A graphic method for recording these results was devised by Fairman and Schwab (2). This represented an important contribution. The major disadvantage of the foregoing scaling technique lies in its pooling of performance items (*e.g.*, locomotion) and primary manifestations (*e.g.*, rigidity) into a single percentage score, thereby reducing the internal consistency and validity of the scale.

Riklan and Diller (3) presented a 98-item scale of daily living activities. The patient's performance on each item was rated on a three-point scale according to the amount of assistance required. The reported reliability coefficient was .74. Though statistically significant, this coefficient is far too low to allow for any real confidence in the consistency of inter-examiner scoring.

The Northwestern University Disability Scales (NUDS) represent an effort to overcome the disadvantages of previous methods in the construction of a valid and reliable technique for evaluating the total disability of the patient with Parkinson's disease.

METHOD

Clinical experience has suggested that the symptoms of Parkinson's disease make themselves felt most frequently in the areas of walking, personal hygiene, dressing, eating and feeding, and speaking. These five areas constitute the range of the NUDS. It was arbitrarily decided to assign a maximum of 20 points to each of the sub-scales. In this way, a total of 100 points is possible, so that the degree of disability may be expressed as a percentage. It must be stressed that the scales do not yield a true numerical score and cannot be interpreted in this manner. Instead, they provide a baseline against which changes can be compared. The scores represent an ordinal level of measurement, not an interval level (5). Therefore, although we cannot assert that a change from 40 to 50 per cent is equivalent to a change from 70 to 80 per cent, we can have reasonable confidence that both changes indicate real improvement.

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The validity of the NUDS is based purely on its direct approach to what it purports to measure: the extent to which the patient has lost his premorbid efficiency in daily living. Total failure to walk, for example, is rated zero. The walking scale goes on to

TABLE 1

Northwestern University Disability Scales

Scale A: Walking

Never Walks Alone
0 Cannot walk at all, even with maximum assistance.
1 Needs considerable help even for short distances; cannot walk outdoors with help.
2 Requires moderate help indoors; walks outdoors with considerable help.
3 Requires potential help indoors and active help outdoors.
Sometimes Walks Alone
4 Walks from room to room without assistance, but moves slowly and uses external support; never walks alone outdoors.
5 Walks from room to room with only moderate difficulty; may occasionally walk outdoors without assistance.
6 Walks short distances with ease; walking outdoors is difficult but often accomplished without help; rarely walks longer distances alone.
Always Walks Alone
7 Gait is extremely abnormal; very slow and shuffling; posture grossly affected; there may be propulsion.
8 Quality of gait is poor and rate is slow; posture moderately affected; there may be a tendency toward mild propulsion; turning is difficult.
9 Gait only slightly deviant from normal in quality and speed; turning is the most difficult task; posture essentially normal.
10 Normal.

Scale B: Dressing

Requires Complete Assistance
0 Patient is a hindrance rather than a help to assistant.
1 Movements of patient neither help nor hinder assistant.
2 Can give some help through bodily movements.
3 Gives considerable help through bodily movements.
Requires Partial Assistance
4 Performs only gross dressing activities alone (hat, coat).
5 Performs about half of dressing activities independently.
6 Performs more than half of dressing activities alone, with considerable effort and slowness.
7 Handles all dressing alone with the exception of fine activities (tie, buttons).
Complete Self-Help
8 Dresses self completely with slowness and great effort.
9 Dresses self completely with only slightly more time and effort than normal.
10 Normal.

Scale C: Hygiene

Requires Complete Assistance
0 Unable to maintain proper hygiene even with maximum help.
1 Reasonably good hygiene with assistance, but does not provide assistant with significant help.
2 Hygiene maintained well; gives aid to assistant.
Requires Partial Assistance
3 Performs a few tasks alone with assistant nearby.
4 Requires assistance for half of toilet needs.
5 Requires assistance for some tasks not difficult in terms of co-ordination.
6 Manages most of personal needs alone; has substituted methods for accomplishing difficult tasks (electric razor).
Complete Self-Help
7 Hygiene maintained independently, but with effort and slowness; accidents are not infrequent; may employ substitute methods.
8 Hygiene activities are moderately time-consuming; no substitute methods; few accidents.
9 Hygiene maintained normally, with exception of slight slowness.
10 Normal.

TABLE 1—*Concluded*

Scale D: Eating and Feeding*

Eating

0 Eatings is so impaired that a hospital setting is required to get adequate nutrition.
1 Eats only liquids and soft food; these are consumed very slowly.
2 Liquids and soft foods handled with ease; hard foods occasionally eaten, but require great effort and much time.
3 Eats some hard foods routinely, but these require time and effort.
4 Follows a normal diet, but chewing and swallowing are labored.
5 Normal.

Feeding

0 Requires complete assistance.
1 Performs only a few feeding tasks independently.
2 Performs most feeding activities alone, slowly and with effort; requires help with specific tasks (cutting meat, filling cup).
3 Handles all feeding alone with moderate slowness; still may get assistance in specific situation (cutting meat in restaurant); accidents not infrequent.
4 Fully feeds self with rare accidents; slower than normal.
5 Normal.

Scale E: Speech

0 Does not vocalize at all.
1 Vocalizes but rarely for communicative purposes.
2 Vocalizes to call attention to self.
3 Attempts to use speech for communication, but has difficulty in initiating vocalization; may stop speaking in middle of phrase and be unable to continue.
4 Uses speech for most communication, but articulation is highly unintelligible; may have occasional difficulty in initiating speech; usually speaks in single words or short phrases.
5 Speech always employed for communication, but articulation is still very poor; usually uses complete sentences.
6 Speech can always be understood if listener pays close attention; both articulation and voice may be defective.
7 Communication accomplished with ease, although speech impairment detracts from content.
8 Speech easily understood, but voice or speech rhythm may be disturbed.
9 Speech entirely adequate; minor voice disturbances present.
10 Normal.

* Eating and feeding are figured separately and the two scores added.

define 10 more points of increasing independence and efficiency in locomotion, ending in normal walking, which is given a value of 20. It is felt that specific definition of the intermediate scale points is a significant improvement over previous methods. The scales are reproduced in their entirety in Table 1.

The NUDS do not attempt to measure the patient's capacity for performing, nor do they aim to quantify rigidity or tremor. It is apparent that objective measurements are more appropriate in these applications. Rather, the scales attempt to quantify what the patient actually does in his daily routine. Obviously there is not necessarily a one-to-one relationship between maximum and habitual performance. Some patients with severe rigidity of the extremities and trunk manage their everyday affairs with surprising efficiency; others, with only mild unilateral impairment, conduct their lives as invalids. The disproportion between maximum and habitual performance in many patients became apparent in the course of the present investigation. Further studies to determine its significance are being conducted.

Clinical observation and interviewing are employed in determining the degree of disability with the NUDS. It must be emphasized that this is not a questionnaire device; good interviewing is essential if results are to be meaningful. No direct question-answer approach can be considered to be adequate. Furthermore, direct observation of the patient's behavior is required to validate the impressions gained through inter-

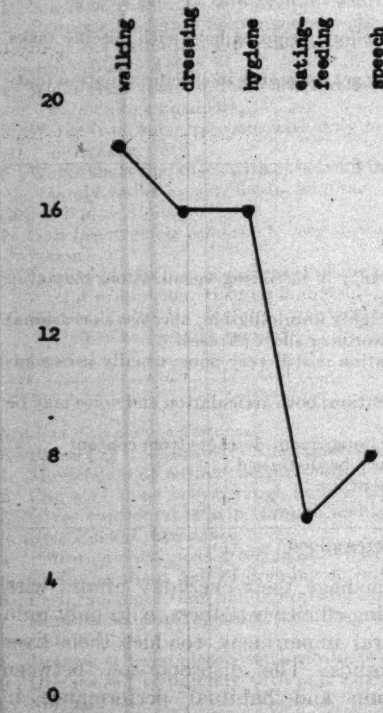

FIG. 1. Disability profile of a post-encephalitic patient with focus of involvement in the cranial-nerve musculature.

viewing. The assistance of a friend or relative is often useful in obtaining a more nearly complete picture of routine performance than the patient is able to give. The need for such additional help is critical when the patient has a severe speech disorder.

Having determined the scale value of the patient in each of the five areas, the examiner computes the total. The difference between a given score and 100 reflects the degree of disability. Recognizing the usefulness of the graphic profile technique of Fairman and Schwab (2), the present writers have incorporated a similar manner of reporting results. The graph is particularly revealing in patients with different degrees of disability in the various functional areas. Characteristic profiles of Parkinsonian patients are illustrated in Figures 1 and 2.

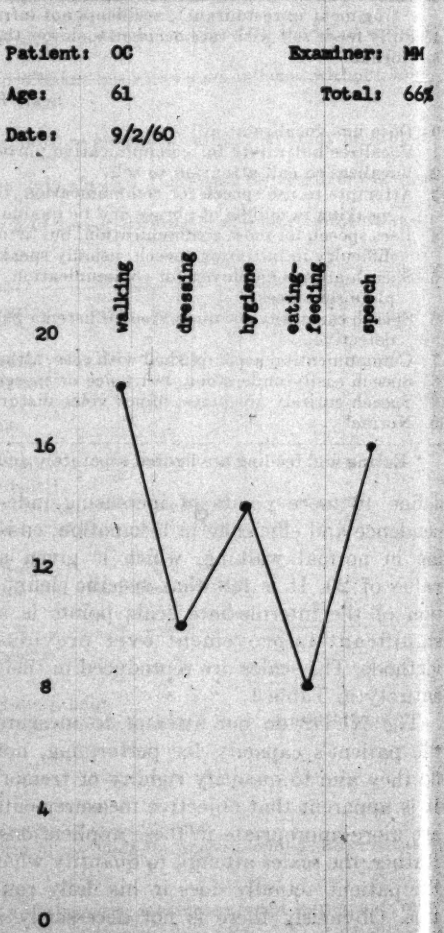

FIG. 2. Profile of a female patient with marked rigidity of the upper extremities.

TABLE 2
Reliability Measures of Northwestern University Disability Scales

Scale	Coefficient of Concordance (W)	Mean Percentage of Disagreement
Speech	0.84	5.1
Eating/Feeding	0.89	5.0
Dressing	0.90	4.4
Hygiene	0.92	4.1
Walking	0.93	3.8
Total	0.95	3.3

RELIABILITY

To determine the consistency with which different examiners were able to rate patients on the NUDS, a series of 26 consecutive Parkinsonian patients were rated independently by three examiners on the same day for a given subject. Because only an ordinal level of measurement is achieved on the scales, it was considered inappropriate to employ parametric correlation methods. Instead, the distribution-free Kendall coefficient of concordance (4) was computed. Reliability coefficients were derived for the five individual sub-scales, as well as for the total disability scores.

Inter-rater reliability for the total scale was quite high, with W—the coefficient of concordance—equal to .95. This represented a mean percentage of disagreement of 3.3. As should be expected, the sub-scales had somewhat lower reliability, ranging from .84 (speech) to .93 (walking). These data are summarized in Table 2.

Because it is well recognized clinically that Parkinsonian patients are characterized by considerable variability, it would seem prudent to evaluate a given patient more than once to obtain a more reliable baseline against which to measure the effects of treatment. With this in mind, the NUDS should have value in studying the natural history of the disease, as well as the effects of treatment. The degree of reliability is sufficiently high that the NUDS can be recommended for use in research.

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THE EFFECTS OF DRUG-INDUCED PARKINSONISM ON THE PSYCHOMOTOR PERFORMANCE OF CHRONIC SCHIZOPHRENICS[1]

LELON A. WEAVER, JR., PH.D.[2] AND GEORGE W. BROOKS, M.D.[3]

INTRODUCTION

The interrelations between phenothiazine-induced extrapyramidal dysfuncton and clinical status have been the subject of much discussion, conjecture and review since the early use of these drugs. Guggenheim and Cohen (2) discussed some theoretical considerations in Parkinsonism induced by tranquilizing drugs. Deniker (1) reviewed the current status of the problem. Many clinical investigators feel that the ability to induce the dysfunction is related to the therapeutic effectiveness of the compounds studied. The dysfunctions induced are the classic ones familiar in post-encephalitic extrapyramidal disorders, including akinesia, Parkinsonism, akathisia, oculogyric crises, dystonia and hysteriform attacks. Such extrapyramidal dysfunction in non-drug-induced cases is associated with pronounced decrement of psychomotor activity, particularly in the finer and more discrete movements (3).

In 1939 Winkelman (5) reported objective deficit in fine manipulative movements. Such skilled acts as piano playing, typing or fastening buttons became slow and clumsy; rapid, alternating movements were slow and irregular.

The first manifestations of drug-induced Parkinsonism have usually been in the distal extremities. Earliest involvement most often occurs in the hands, as cogwheel rigidity found on examination in the interossei muscles and as micrographia on the behavioral level. More severe cases involve, successively, the muscles of the arm and upper shoulders. It seemed probable that these symptoms would occur in approximately the same sequence under conditions of increasing doses of a tranquilizing medication known to produce symptoms of Parkinsonism.

This report will be concerned with the relationships between clinical evaluation of the drug-induced symptoms and the performance on a battery of psychomotor tests designed to measure a wide range of psychomotor behavior.

We anticipated that these relationships between extrapyramidal system (EPS) dysfunction and the psychomotor performance would be rather complex. Two specific hypotheses were formulated for test:

1) The level of psychomotor performance would be negatively related to the level of EPS dysfunction. This means that, with increase in frequency and/or severity of symptoms of drug-induced Parkinsonism, the level of psychomotor performance would be adversely affected.

2) Drug-induced Parkinsonism should cause a deficit in fine psychomotor performance, whereas gross psychomotor performance should be less affected. Fine psychomotor activity means either the use of small muscle groups or the employment of large muscle groups on tasks which require precision rather than speed. Gross activity, on the other hand, requires relatively greater amounts of speed than precision, and generally requires the use of large muscle groups.

[1] This study was supported by National Institute of Mental Health Grant #1752, and conducted through the clinical facilities of the Vermont State Hospital, Waterbury, Vermont.

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METHOD

Subjects: The subjects were 14 chronic schizophrenic patients, seven of each sex. All had definitely benefited from a variety of tranquilizing medications over the preceding two to five years, but had retained many disabling symptoms. The mean age was 44.4 years, with a range of 25–56 years. The mean duration of hospitalization was 14.2 years, with a range of from three to 21 years. The basis for selection was unsatisfactory progress in an intensive rehabilitation program.

Medication Regimen: At the beginning of this study, 13 of the 14 patients were taking phenothiazines. Ten were taking Compazine, in doses ranging from 30 mg. to 105 mg. daily; one was taking Trilafon, and two, Stelazine. All but three of these 13 patients were receiving other medication to relieve symptoms of extrapyramidal dysfunction, primarily benztropine methanesulfonate, but also occasionally trihexyphenidyl, methylphenidate hydrochloride or procyclidine hydrochloride. They were all reasonably calm with the help of their medication but, as noted, none was particularly active or sociable. The programed changes in medication are given below; the day cited is the first on which the medication change could affect behavior:

1) Usual medication for the initial three days.
2) On day 4, the usual anti-Parkinsonism medication was withdrawn and 1 mg. of SKF #7261 substituted for one-half the usual tranquilizing medication.
3) On day 6, 2 mg. SKF #7261 were substituted for all tranquilizing medication.
4) On day 8, this dose was increased to 4 mg.
5) On day 10, the dosage had to be individualized by reduction in several instances, and by the addition in all cases of 2 mg. benztropine methanesulfonate.

Individualized dosage was continued throughout the remainder of the study.

Motor Dysfunction: The psychiatrist determined the degree of extrapyramidal motor system dysfunction by a brief neurologic examination consisting of inspection of the patient while sitting, standing and walking. Each elbow joint was passively flexed, with concurrent palpation of the anterior muscle mass of the arm for determination of resistance to passive stretch, and either obvious cogwheel rigidity or a palpable cogwheel phenomenon in the muscle mass. Judgments were recorded on a three-point scale (0—none, 1—some, 2—marked). The group status was estimated by summing the ratings assigned to the individual patients.

Psychomotor Tests: A battery of five psychomotor tests was administered five days a week for a period of three weeks:

1) *Reaction time.* The subject was required to lift a forefinger from a telegraph key in response to a combined visual and auditory stimulus. The mean of three trials was recorded in 0.01-second units.

2) *Rate of tapping.* The subject tapped with the extended and joined fingers on the telegraph key as rapidly as possible, using either a wrist or a forearm motion. The score was the mean number of taps in two 5-second samples.

3) *Pursuit rotor.* A circular metal target, one-half inch in diameter, embedded in a turntable 12″ in diameter, revolved in a circle 5″ in diameter at speeds of 16.7, 33.3 and 45.0 rpm. The task of the subject was to keep a hinged metallic stylus in contact with the target. An electric timer cumulated the time in contact. The mean of two ten-second trials at each speed was recorded.

4) *Serial reaction time.* Five target plates, 2″ in diameter, were arrayed linearly 2½″ apart on a metallic surface. Each target had an associated signal lamp. The task of the subject was to tap with a wand on the target plate in front of the illuminated lamp. This extinguished that lamp and illuminated the next in the series. Twenty

such responses constituted one trial. One trial a day was made on each of the five stimulus sequences available. The score was the mean number of seconds to complete a trial.

5) *Transport-manipulation test.* This test consists of a grooved pegboard. (The shouldered pegs must be properly aligned with the grooved holes before insertion.) In addition, there is a magazine to hold the pegs, connected to capacitance-operated relays, so that separate measurements can be made of the time spent in a) grasping a peg, b) transporting it from the magazine to the pegboard, c) placing it in the pegboard, and d) returning the empty hand to the magazine. Two trials were given. The scores were the mean times required to fill the board with the 25 pegs.

To refer back to the previous discussion of fine and gross psychomotor activities, it is immediately apparent that the various tests contain aspects of both of these activities. The rate of tapping as used in this study involves gross activity primarily, since most of the arm muscles are involved. The reaction time test may contain either type of activity, depending upon the method of response adopted by the patient. If a simple finger lift is employed, the activity is fine, since it involves only a small muscle group. If, however, the patient elects to withdraw the hand or lift the arm to effect the response, then large muscle groups are involved and the activity is essentially gross. For this reason, this test cannot be classified unequivocally. But no matter which method of response is adopted, the measure is one of the speed of initiating movement, and is thus different from the tests which involve measurement of the speed of continued movement. The serial reaction time test involves both types: gross in the rapid reaching movement, and fine in the eye-hand co-ordination required to hit the target. The two types cannot be measured separately here. The transport-manipulation test also contains both types, but here, separate measurement has been accomplished. The two manipulation components are largely fine, whereas the two transport components are for the most part gross. The pursuit rotor test also has both elements.

RESULTS

The results of the ratings of extrapyramidal motor dysfunction as a function of the medication changes are presented in Figure 1. In general, there was an increase in the amount of dysfunction associated with each change in medication (indicated by the arrows), with recovery following dose individualization and the addition of benztropine methanesulfonate. Other EPS dysfunctions were noted. All patients complained of insomnia, and most patients, of restlessness. Most showed increased resistance to passive stretch in the muscles surrounding the elbow joint. In several cases this was of a plastic, lead-pipe type, not the cogwheel rigidity usually observed. These side-effects usually responded readily to the addition of 2 mg. of benztropine methanesulfonate. These data form the background for evaluating the results of the psychomotor tests.

The results of the psychomotor tests are presented in Figures 2–4. In the interest of brevity, only representative curves are shown. The shape of the data curves for reaction time, rate of tapping and serial reaction tests was similar. Figure 2 presents the results for the serial reaction test as representative of these tests where little or no learning was shown. In all cases, improvement had ceased by the third day. There was a clear pattern of decrement in performance with an increase in drug-induced Parkinsonism, followed by recovery when anti-Parkinsonism medication was added.

Since there was no essential difference between the functions as measured, the two transport and the two assembly elements were combined. These data are contained in

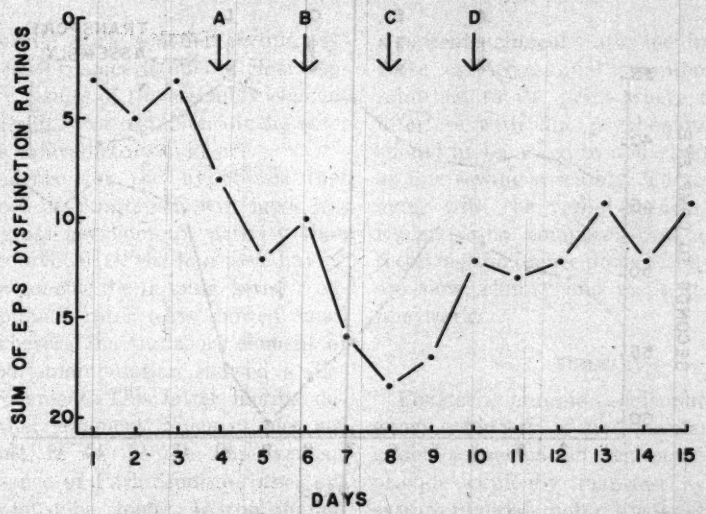

FIG. 1. The relationship of extrapyramidal motor system dysfunction to medication changes. Points A, B and C indicate increases in tranquilizing medication. Point D indicates the addition of anti-Parkinsonism medication. The ordinate is the sum of ratings assigned to the individuals in the group.

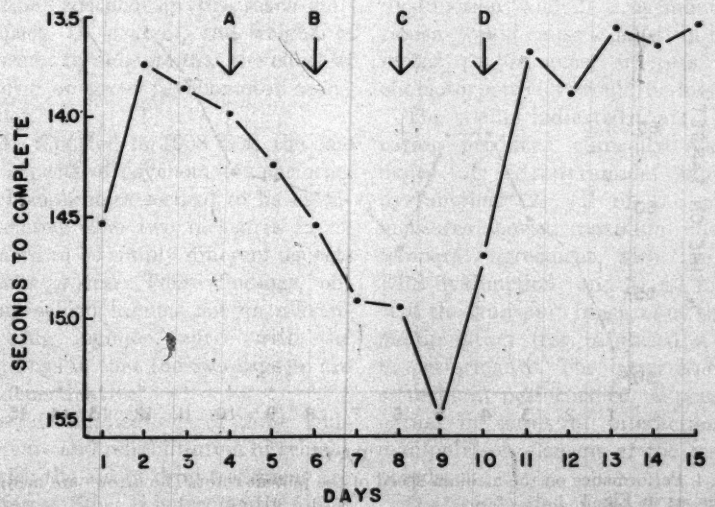

FIG. 2. Performance on the serial reaction time test. The arrows are medication changes, as in Fig. 1.

Figure 3. It is apparent that the assembly element showed some decline in performance during the more severe stages of Parkinsonism. Also apparent is the fact that the transport element improved during the Parkinsonism and declined with the return to the more normal function.

The data for the medium speed of the pursuit rotor, selected as representative of the three speeds used, are presented in

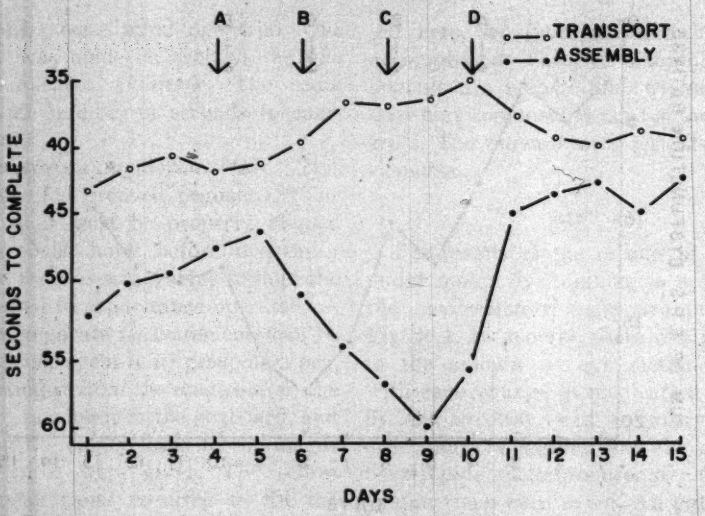

FIG. 3. Performance on the transport-manipulation. The arrows are medication changes, as in Fig. 1.

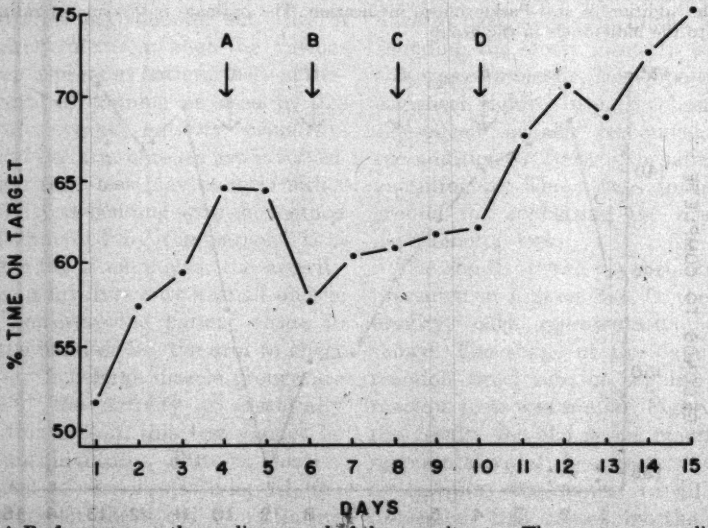

FIG. 4. Performance on the medium speed of the pursuit rotor. The arrows are medication changes, as in Fig. 1.

Figure 4. The characteristic effect seen here is a deflection or inhibition in the learning curve. Improvement in performance ceases with the onset of Parkinsonism, and resumes when the Parkinsonism is controlled.

In general, the psychomotor test results show a change which, with one exception, was a decline centering around day 9. Although they differed in sensitivity, the tests tended to reflect the amount of EPS dysfunction.

The hypothesis that drug-induced Park-

insonism would cause a deficit in fine psychomotor performance is offered clear support by the results of the assembly element and the pursuit rotor test. None of the other tests offers contradictory evidence.

The evidence for the hypothesis that drug-induced Parkinsonism will have less effect on gross psychomotor activity than on fine is equivocal. Of the four tests having a gross component, the tapping, serial reaction and pursuit rotor tests showed small declines, whereas the transport element of the transport-manipulation showed a distinct improvement. This latter finding deserves further comment. Since it does not seem rational to ascribe this improvement to the presence of Parkinsonism, other explanations must be sought. In the opinion of the psychiatrist, the patients became disturbed at the difficulty encountered in grasping and inserting the pegs, and, in compensation, speeded up the reach-and-return aspect. In general, the weight of evidence seems to indicate that the effect of Parkinsonism on gross psychomotor activity is minor.

King (4) reported in 1958 that the fine and gross aspects of psychomotor performance in schizophrenics seemed to be essentially unrelated. The two measures in no way appeared to be simply different aspects of the same process. These findings, obtained from schizophrenics not on a tranquilizing drug regimen, agree with the present findings in that the two aspects are largely independent.

The possible implications of these findings in the care and rehabilitation of schizophrenics with the aid of drug treatment are of some interest. Since it is frequently found that the patients need some feeling of accomplishment from their early work and activities, it seems important that they be given tasks which require more gross motor movement and be protected, at least temporarily, from work requiring finer manipulative movements of the fingers. Only when a patient's clinical status has improved and these extrapyramidal symptoms have diminished to the point where they do not interfere with fine psychomotor activities should he be asked to undertake such work as fine sewing assembly. These conjectures agree with the verbal reports of activity leaders, who complain that the patients receiving the higher doses of phenothiazines are slow, clumsy and inept at detailed or fine work.

SUMMARY

Fourteen chronic schizophrenics were given a battery of five psychomotor tests under a medication regimen designed to provide clinically manifest symptoms of extrapyramidal motor dysfunction. It was hypothesized that: 1) the level of psychomotor performance would be negatively related to the level of extrapyramidal motor dysfunction; and 2) drug-induced Parkinsonism would cause a deficit in fine psychomotor performance, whereas gross psychomotor activity would be less affected.

The results indicated that: 1) the medication produced clinically apparent evidence of extrapyramidal motor system dysfunction; 2) all of the psychomotor measures showed maximum effect in close temporal agreement with the maximum EPS dysfunction; and 3) all measures except the transport function of the transport manipulation test exhibited a decrement in performance. The latter showed an increment in performance. A possible explanation in terms of interaction with the manipulation element of the test was proposed.

The conclusions were that: 1) the psychomotor tests are sensitive to the presence of drug-induced extrapyramidal motor system dysfunction, with the transport-manipulation test exhibiting the best differential effect, and 2) fine psychomotor co-ordination is more affected than are grosser measures.

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FEDERN'S CONCEPTS AND THEIR APPLICABILITY TO THE UNDERSTANDING AND TREATMENT OF SCHIZOPHRENICS[1]

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Since it is impossible to present in one communication all the complexities of Federn's concepts and their application in therapy, this paper will deal with a few main points that may convey an overview of his psychology.

Federn made his great contributions in the field of ego psychology. The phenomena with which his original concepts deal can best be studied in the ego disturbances of psychotic patients. Just as the study of physical disease facilitates our understanding of the normal functioning of the body, so the study of psychopathology enables us to explore the normal functioning of the mind. Federn not only utilized the manifestations of psychotic disturbances but also progressively applied his new insights to the study of neurotic and of healthy persons. He defined psychotic affliction as a functional impairment of the ego itself, whereas in the neurotic patient there is no impairment of the integrative patterns, such as thinking, perceiving and sensing reality. Neurotic symptoms are expressions of defenses against the pressures of impulses which must be repressed from the ego.

Difficulties arise in presenting Federn's concepts. In the first place, his ego psychology was phenomenologic. Then, too, he introduced points of view not encompassed in Freud's teachings. But the greatest difficulty results from the different values ascribed to the ego by other analysts. For example, seven different concepts of the ego may be distinguished within the Freudian school of psychoanalysis. Some of Federn's concepts are at variance with Freud's, as will be explained below.

Federn was a loyal pupil of Freud's, and not only studied Freud's revolutionary findings thoroughly, but also assumed the role of interpreter of Freud (as he himself said on several occasions). Because of this strong feeling of loyalty to Freud, Federn was slow to recognize the differences between them: only three weeks before his death did he realize for the first time how essential were the divergencies in their concepts of the ego (2).

Federn equated the ego with the experience of one's existence, which is a continuous experience unity, identical with ego feeling. The ego feeling is not limited to one's consciousness, but is the feeling of existence in its whole extension, including some unconscious mental data. These unconscious mental contents encompassed in the ego feeling are the preconscious data. At any given time the ego is conscious in only a limited area, but the ego feeling, in waking life, continuously encompasses the whole preconscious field. It is this extension of ego feeling over the preconscious which gives us confidence in our ability to behave and to express ourselves in a coherent way. We have the assurance that all necessary knowledge and past experience are within our immediate reach, ready to be called upon as needed. For example, one can tie a shoelace or button a button almost automatically. If one drives a car, one knows how to start it, steer and brake, with but little conscious attention. And one can drive to a familiar place without having to call up a mental map or to make a decision at each intersection. This is because the *feeling*

[1] Adapted from a paper given at the Forest Hospital, Des Plaines, Illinois, December, 1960.

[2] 737 North Michigan Avenue, Chicago, Illinois.

extends over the needed data in the preconscious. If, on the other hand, some needed data fall out from the preconscious, then one becomes unsure. (A common and uncomfortable example of this is stage fright.)

The cathexis which powers the ego feeling and its functions Federn calls "ego cathexis." He defines it as a fusion of varying proportions of three basically different forms of cathexis (1, p. 227). These arise from physiologic and endocrine stimulation. Federn maintained his belief in Freud's original drive dualism: the self-preservation and race-preservation instincts, *i.e.*, the ego and sexual instincts. When Freud introduced his concept of the death instinct in 1920, this too Federn accepted wholeheartedly; the dynamic expression of the death instinct he called "mortido." So his concept of cathexis is threefold: 1) self-preservation, not powered by libido, and not so powered even in Freud's earlier theory; 2) libido, and 3) mortido. Depending upon the proportion of libido and mortido fused in the ego cathexis, one feels one's existence as enjoyable or sad. In extreme depressive states, one has the urge to cease to live. The other form of cathexis, self-preservation, is manifested in the physiologic functions—muscular activity, thinking, etc. —as long as they serve the defined purpose. These functions can, however, become eroticized, and then they are powered by libido as well.

Federn considered different modes of operation of the ego cathexis. In addition to the active, passive and reflexive modes made familiar to us through grammar, he indicated an intransitive one, which he regarded as the most important and the one experienced earliest by the ego. This neutral, objectless form of ego cathexis he called the "medial" cathexis. It may be expressed by such phrases as "I live," "I grow," "I thrive," or, in case of a predominant mortido component, "I age," "I die," "I perish."

According to Federn, the psychotic diseases are a consequence of economic impairment of the ego, and the specific psychotic manifestations are due to that specific part and function of the ego which has suffered impoverishment of cathexis. Here the basic difference arises between Freud and Federn in their concepts of the psychoses—schizophrenia, paranoia, and so on. According to Freud, psychosis ensues through a regression of the libido to the state of primary narcissism, whereby object love and object interest are relinquished. The patient's interest is withdrawn from the external world and concentrated on himself. In other words, in Freud's view the narcissism takes place at the expense of object love and interest. In his study of schizophrenic patients, Federn, however, came to the conclusion that their egos, far from being overcathected, are in fact insufficiently cathected. The schizophrenic process sets in *before* the patient loses interest in the external world and, in Federn's view, the progressive withdrawal is due to the need of the ego to direct all available cathexis toward its own depleted functions. In other words, the ego becomes depleted *first*, and then, from economic necessity, withdraws from objects. If the ego had sufficient ego cathexis, or an abundance, it would have no need to withdraw from objects; but the weakened psychotic ego cannot afford to maintain object interest. During the course of this withdrawal, some psychotic patients have the feeling that the world is coming to an end. In an externalized form, this expresses the sensation which is due to a fading of the ego feeling—that the ego itself is dying, rather than that it is losing interest in objects.

Another great difference between the concepts of Freud and Federn regarding psychotic delusions and hallucinations may be seen in Federn's distinction between "testing reality" and "sensing reality." As a preliminary to clarification of this distinction, the dynamic ego boundaries require brief

mention. In the ego cosmic stage, as postulated by Federn, both internal and external stimuli are experienced with the feeling of "Thess," that is, as features of one's own ego. Visual, tactile, acoustic—*all* sensory contents are felt as continuously changing features of one's ego. The discovery by the ego of the external world of objects rests on the progressive establishment of dynamic, flexible bodily and mental ego boundaries. In fact, the existence of dynamic ego boundaries is the *sine qua non* for the perceptive function. The ego feeling has a flexible extension; the dynamic ego boundary normally extends over the sense organs. One perceives objects of the external world as such when stimuli, in reaching the sense organs, impinge upon this dynamic external ego boundary. The ego is separated from the mental non-ego territory, the id, by a dynamic internal boundary.

The formation of the mental and bodily ego boundaries is mobilized by a learning process which Freud called "reality testing." For therapeutic orientation in the treatment of patients suffering from delusions, this process is important. Federn succeeded in treating patients suffering from delusions of recent origin by training them thoroughly in the proper use of reality testing (1, pp. 184–196). The more successful a patient becomes in using this function properly, the stronger becomes his internal ego boundary, that is, toward the id. From Freud's teaching we know that the earliest reality testing is based on the experience of sensory changes in response to bodily movement. It is assumed, on good evidence, that in earliest infancy the child hallucinates as a first attempt to find satisfaction of his needs. But through motility the ego soon learns to distinguish between stimuli from the world of objects and stimuli from within itself. If the child turns his head or closes his eyes, the character of the external world changes, as well as his own position in relation to it, but his hallucinatory world remains the same. In further development he learns that his discomfort is appeased not by hallucination but by the "real thing." So, progressively, memory and the thinking function become important in the testing of external reality.

An example of normal adult reality "testing" on a mass scale was given us when, in 1938, Orson Welles produced a radio play in which "Martians" were reported to have invaded the earth and to be approaching New York. Many listeners were badly frightened; some even panicked. No one thought that what he had heard on the radio was a hallucination. The *sense* of reality of the listeners functioned perfectly. But how did different individuals *test* the reality of the content of what they heard? Some knowledgeable people knew immediately that no Martians could invade the earth: their knowledge of astronomy, biology and other sciences indicated to them that this was a fictional program. They had no need to test. (Neither does the paranoic patient test the reality of the contents of his delusions.) Some listeners, however, turned their radios to another station. They reasoned that, if the event was real, all stations would be giving the same warning. When they heard music on other stations they realized that the Martian emergency was only a play. Still others telephoned to the New York newspapers to ask whether the radio program was factual or merely a joke in bad taste. All of these people except the first mentioned resorted to reality testing. But the paranoic, like the educated man, has assurance of his reality without testing. He does not use reality testing to check whether the contents of his delusions are real, because he is as sure of their reality as the others were of the fictional nature of Welles's play.

One must bear in mind that "sensing reality" and "testing reality" are different ego functions. As Federn has shown, the ego must *sense* the stimuli of the external world as *non-ego* qualities to *perceive* them as such. Reality testing alone could not lead

to perception of the external world. And so it is evident that the discrimination by the ego between mental, internal (unreal) and external (real) presupposes the existence of ego boundaries. In the process of normal development the bodily sense organs become invested by the external boundaries of the mental and bodily ego. Only then does the ego begin to perceive colors, sounds, etc., as properties of external objects and cease to experience them as features of itself. As already stated, only when stimuli from the external world, in reaching the bodily sense organs, impinge on a dynamic ego boundary are sensory properties *perceived* as qualities of objects. In other words, by interposition of dynamic ego boundaries, ego experiences of a "medial" character—that is, intransitive, objectless experiences—are turned into perceptions of objects.

In some pathologic conditions, later in life, the external ego boundary may become weakly cathected, or the ego cathexis may withdraw from the bodily sense organs. Then the perceived objects seem more or less unreal to the ego, much as do mental contents. This phenomenon is known as "feeling of estrangement," or derealization of the external world. The perceptive distinction between "internal mentality" and "external reality," to use Federn's terms, is never made by reality testing. Psychotic patients feel their delusions and hallucinations as real, as existing in the external world, and hence have no need to "test," because the exciting stimuli from the repressed id impinge on the internal ego boundary from outside the ego. This boundary, having become pervious to stimuli from the internal mental *non-ego* territory, can no longer resist strong pressures from this area. This is normally the case in the state of sleep, when the ego dreams.

Some paranoic patients have a great capacity for testing reality. This is evident from their ability to "prove" that the contents of their delusions are real. The "secondary elaboration," now called "secondary revision," of their delusional systems (which is very impressive in paranoic patients) presupposes that that function usually employed for testing reality be effective. Paranoic patients use reality testing in reverse, as it were. With intelligent selection, they make use of all of the facts of the external world which they perceive correctly to prove that what they sense as real is actually real. They also manage to avoid all proofs to the contrary. Effective therapeutic intervention, as Federn found, consists in channeling this existing capacity in the proper direction. As a result, the ego boundaries are strengthened. On the other hand, in the case of patients suffering from feelings of de-realization, who sense perceived objects as unreal, no amount of reality testing of any kind can enable them to sense these objects as real.

Not only are feelings of de-realization (estrangement) brought nearer to our understanding through Federn's concepts of ego extension, but feelings of de-personalization also. When the ego cathexis, experienced as bodily ego feeling, withdraws from a portion of a person's own body, the individual no longer feels that the body part belongs to him, in spite of the fact that no sensory or motor function is impaired. In minor cases the ego feeling can be restored to its full extension by willful effort or by muscular activity.

According to Freud, the delusions and hallucinations of psychotic patients are attempts at restitution of the external world from which they have withdrawn in narcissistic regression. In his concept, instead of recapturing the lost external world, they succeed in creating only a false reality. Federn disagrees. He considers hallucinations and delusions (false reality) as an effect of a dynamic lesion of the inner ego boundaries. Different psychotic manifestations are the result of the dynamic impairment of different functional parts of the ego. Federn analyzed the thinking process thoroughly, and described the metapsychologic forms of its impairment—as, for in-

stance, in his explanation of the specific deficiency in schizophrenic patients who have lost the capacity for abstract thinking.

Remembering a specific, concrete object, we think of *that* book, *that* table, *that* house. This is a mnemonic reproduction of the exact perceptive experience of the object. In abstract thinking, we have the idea of a given kind of object—*a* book, *a* table, *a* house. Elements common to various experience situations form our abstract concepts; these elements must be sensed, recognized as such, isolated and purified from other contents of the ego states which were their source. This process requires an expenditure of ego cathexis. An ego with deficient cathexis may lose the ability to think of *a* book, *a* table, *a* house, and be able to produce only the memory of single, concrete books, tables and houses.

In Federn's view, a deficient supply of ego cathexis is responsible for three main pathologic features of schizophrenia. One feature is the regression of the ego to former states, and sometimes to the earliest ego stages, as an economic protection against its own disintegration. (This regression accounts for various schizophrenic symptoms, which can be explained only by study and understanding of the early ego stages.) The second main feature is the false realities, hallucinations and delusions, caused by weakening of the inner ego boundaries. The third is the loss of the ability for abstract thinking.

Of great scientific and therapeutic importance is Federn's accurate and detailed study of the ego in the state of dreaming. Before Federn, analysts had given this subject no serious consideration. In the dreaming state the ego often feels, acts and reacts to the dream events quite differently from the way it would function in waking life. This difference is explained in part by the fact that the ego is only partially awakened by the dream, and is often awakened only to an earlier ego stage. The thinking function may be very deficient, and many essential memories, both old and recent, may remain dormant while the ego dreams. In fact, the attitude of the dreaming ego toward absurd manifest dream events often impresses one as ridiculous. Situations to which the ego would react with horror or despair in waking life may be accepted quite casually by the dreaming ego. Not only are motility and bodily ego-feelings often dormant, but also the reactions of the mental ego may be deficient and even quite weird. We can understand these attitudes and reactions of the ego in the dreaming state when we realize that the dreaming ego is much closer to id phenomena than is the waking ego, because in the state of sleep the inner ego-boundary is relaxed. It is interesting to learn, from Federn's studies, that many traits of the dreaming ego are found also in schizophrenic egos. Both the dreaming ego and the schizophrenic ego seem to "understand" id phenomena better than do normal egos in waking life. This attitude of the ego toward the id has been very successfully utilized by Sèchehaye (3). With great intuition she has been able to procure symbolic gratification of the needs of her schizophrenic patients, thereby lowering their inner tensions.

Of relevance here is an experience attributed—rightly or wrongly—to Ferenczi. At one time it was said that he had a highly intelligent, hospitalized schizophrenic patient who was most helpful to him: whenever Ferenczi had difficulty in deciphering the dream of another patient, he would relate the dream to the hospitalized schizophrenic—and this patient's interpretation was often found to be acute and insightful.

With recognition of the ego-economic point of view, and with some understanding of the various specific dynamic impairments, the therapist's orientation in treating psychotic patients becomes clear:

First, the patient's integrative task must be lessened. He should not be pushed to achievement, production and responsibility; rather, he should be relieved of these pressures. The schizophrenic patient often reacts automatically with the defense of re-

gressing to a former ego stage, one in which he was able to function on a lower level of performance and responsibility. Such regression must be respected until the patient's ego is strong enough to assume more difficult obligations.

Second, the patient should not be pushed toward object relations which would constitute a drain on his ego-cathexis resources, nor should positive transference be analyzed.

Third, we must respect repressions and other defense mechanisms, rather than challenge the patient's ego to accept and integrate conflicting drives.

Finally, to compensate for the lack of love and understanding which the psychotic patient suffered in childhood, particularly in a poor mother-child relationship, the analyst must be able to *give* to the patient with his understanding. Under no circumstances should he deceive the patient. In addition, according to Federn, a trained woman therapist should always participate in the psychotherapy of psychotic patients.

Federn's concepts bring many ego phenomena nearer to our understanding. Only one more of these important phenomena will be mentioned here: *identification.* As Federn discovered through his accurate analysis, the identification of the ego with another person is much more than imitation or autoplastic duplication. Such duplication alone does not constitute identification. But when the autoplastic duplicate becomes ego-invested, when the ego *feels* this duplicate as an aspect of itself, then we can truly speak of identification. My own extensive elaboration of this concept of Federn's led me to an understanding of the paranoid delusion in which the patient believes that he is influenced by other people (the phenomena of echopraxia and echolalia of schizophrenic patients).

Recognition of three kinds of ego activity in the phenomenon of identification is essential. First, there is the act of imitation, whereby some feature of the object becomes echoed in the ego. Second, the ego cathexis (or ego feeling) extends over this duplicate. This is an actual incorporation of the duplicate, in which the ego boundary functions as an incorporative mouth. Third, this internalized object must be integrated with the existing ego and its other previously internalized objects. Knowing this, we can understand how important it is that the growing child be provided with proper identification patterns, and how important for the treatment of schizophrenics that they be placed in a proper environment.

An ego can withdraw much more easily from an external object than from an internalized one. From this observation we may understand why schizophrenic patients, who have already succeeded in giving up object love, have to struggle hard to recover the badly needed ego cathexis which has been invested in internalized objects. Through the mechanism of projection they sense that they are being influenced by enemies to think and to act in a certain way, rather than sensing that they are as they are because of their own identification. One part of the ego revolts against that part of the ego which is operating automatically to produce and maintain the identification.

Discussion of the details of ego-building and superego-building identifications lies outside the scope of this paper, as does the difference between Viktor Tausk and the writer in the conception of the "influencing machine." Stress should again be laid, however, upon the importance of the phenomenon of identification in our understanding of the psychoses, since knowledge of the various vicissitudes of internalized objects is of great help in our therapeutic intervention.

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A CASE OF WITCHCRAFT

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Belief in witchcraft is still prevalent. There are sporadic reports of present-day witches in the news and literature (3, 18) and supposedly, the Black Mass is still performed in Europe (7). Historians of witchcraft (12) have stressed that belief in and practice of the black arts during the Middle Ages were mainly reactions of peasants to oppression and persecution by the nobility and clergy. Little has been mentioned, however, about the individual psychodynamics which predispose persons to "bewitchment." The purpose of this paper is to elucidate some of the psychodynamics involved in a family claiming to be bewitched.

The persons studied were of Spanish-American extraction and had lived most of their lives in Colorado. Despite the individual psychodynamic determinants, other factors, such as cultural mores and beliefs, are important in any study of bewitchment. In this particular bewitched family all of these factors converged and were inextricably woven together. The main focus of the paper, however, will be on individual and family psychopathology.

Some belief in witchcraft still persists among many uneducated, rural and low-income Spanish-Americans, and they are apt to interpret any personal or family misfortune as evidence of bewitchment. Bewitchment is referred to as an "*embrujo*," and is caused by a "*bruja*" (witch). *Brujas* may perform either good or evil magic. Once *embrujo* is recognized or suspected, the sufferer usually seeks help from a friendly *bruja*, a "*curandera*" or an "*albolaria*."

Despite some failures, it cannot be denied that many of the *curanderas* produce impressive cures. Senter (16) states: "The principal difference between the concept and treatment of psychosomatic disturbances among native villagers and among presumably scientific urbanites is that among the natives the witch is considered as a necessary intermediary which brings the person and the maladjustment together."

Essentially, the medical knowledge of illness and its treatment comes from four separate sources for these people (15): 1) the medical folklore of medieval Spain; 2) the cultures of American Indian tribes; 3) "Anglo" folk medicine, and 4) "scientific" medical sources. Although modern man generally belittles the social values of magic, for the primitive its social values are of great importance. "Magic supplies primitive man with a number of ready-made ritual acts and beliefs, with a definite mental and practical technique which serves to bridge over the dangerous gaps in every important pursuit or critical situation. It enables man to carry out with confidence his important tasks, to maintain his poise and his mental integrity in fits of anger, in the throes of hate, of unrequited love, of despair and anxiety" (11). Modern man, although relatively free of magical belief, is not altogether free of magical practices.

The family reported here was first brought to our attention after a 17-year-old girl, apparently "bewitched," was admitted to the hospital. The patient, Mary, attributed her *embrujo* to an event that had occurred four days prior to her first symptoms. At that time Mary attended a gathering at her father's house at which her much hated and feared Aunt G. was present. Aunt G. had mistreated Mary when she was younger, but Mary's chief reason for holding a grudge against her was that Aunt G. had predicted that Mary would turn out to be a "whore" like her mother. Mary claimed that, for some unknown reason, Aunt G. had then hypnotized her and forced

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her to have her hair cut. Four nights later Mary went into her first trance.[2] The trances continued every night for over a month, until several days after hospitalization. The patient was completely amnesic as to what transpired during the trances; the information was supplied by her mother and stepfather.

The parents described Mary during her trances as swooning onto the bed, then writhing about and muttering in a frightened voice. The content of her first three trances consisted of her saying, "Give me that doll—don't stab it with the pin." After this she would scream, since in her spell she apparently saw Aunt G. stick a pin through the head of a doll which resembled her and which also had the missing hair on it. According to Mary and her parents, when she emerged from her trances she would have a severe headache, and the next morning large bumps would be noted on both of her temples.

Each new trance was repeated for three straight nights before the content of the trance changed. During the second series of trances Mary would see her Aunt G. holding a doll, and would shout, "Please don't throw me in the cold water"; whereupon she would begin to shiver violently, and her parents would have to wrap her in blankets.

The trances next changed to a cemetery scene, where the effigy doll was put into her grandmother's grave. Next, the trances revealed Aunt G. putting the doll in a hole, and when Mary was brought out of these spells by her stepfather she would always remark that "he" got her out of the "hole." Then the trances changed slightly. Mary was still in the cemetery, but in the distance she could hear a baby crying. This continued for six nights, but on the last three nights, when brought out of the trance, Mary "took the baby's mind" and behaved like an infant.

[2] We use this word to denote the episodes which Mary suffered, associated with sleep and productive of symbolic language and behavior.

The trances continued each night unabated, and the following series took place with Mary in the cemetery again, with Aunt G. hiding behind a monument, or at times sitting on it. The crucifix was given to Mary, but she threw it at her mother and said, "Aunt G. wants me to get rid of this—she doesn't want me to hold it so she can take me to the devil."

Perhaps the most remarkable series of trances followed these. According to Mr. and Mrs. H., Mary went into labor for three nights. Although the patient was reported to be extremely naïve about sex, never having had sexual relations or seen a woman in labor, she would put her hands above her in bed and hold the posts, screaming intermittently with each labor pain, bearing down all the while as the pains came closer together. After about an hour of this her "bag of waters" supposedly broke, and this spontaneously brought her out of the trance. The parents stated that the water that came out was neither urine nor clear fluid; rather, it seemed to be a mucus-like fluid with much hair in it. Interestingly enough, during these spells Mary would scream out at the aunt and say, "You know damn well I don't have a baby—you just stuck something in there so I can act like I have a baby, but I don't have anything—you know damn well I can't have a baby because I never mess around with anybody—you just want people to believe I'm '*pigi*' (pregnant)."

This was the last consistent series of trances. The remainder of the nights before admission to the hospital Mary spent the time in her trances arguing with Aunt G., saying, "You're just waiting until I'm 18 years old to take me to the devil—you just want to teach me witchcraft and take me with you—you sold my soul to the devil."

It is interesting that during Mary's first trance the voice of a *curandera* advised the parents how to bring their daughter out of the trance. Also during these trances, Mary supposedly "grew long nails," and every

time her mother, and less frequently the stepfather, approached her she would scratch and revile them. On one occasion Mary "grew long fangs," which, her parents stated, disappeared after the trance ended, only teeth marks remaining on her lower lip. Several times during the various trances Mary pleaded with her aunt not to burn her, and after the trances the skin on her neck would seem to have been slightly burned. This apparently occurred when Mary referred to her stepfather as "daddy" instead of "stepdaddy," which the aunt wanted her to say. The parents also reported that every time Mary said "daddy" she would "stiffen up," and the aunt would pinch and kick her during the trances "beneath the skin," and "that was why no bruises showed afterward."

Mary had trances her first three nights in the hospital. Only after the visits of the parents were temporarily stopped did her trances cease completely. We were able to obtain a verbatim transcript of one of these trances, and will present a short excerpt. While the nurse was checking her in the early morning, the patient suddenly began to move about in bed and said, "I want my daddy—don't let her pull my hair, daddy—it's nice hair—I want you to hold my hand. . . . I love my stepdad like my own daddy—you always have your mind in the gutter—you think something is wrong with loving my stepdad, you pig—you better shut up—you're making me tired—can't you leave a person alone? You always try to make people think the worst of me—as long as God knows, who cares what you put in people's heads, like my mother—I'm always sticking up for her—she is not the first one to leave daddy. . . ." Although Mary was amnesic for what had transpired during the trance, when she wakened she seemed quite frightened, but could not account for her mood.

We might mention a few of the various means employed to bring Mary out of her trances to illustrate the methods of these people in dealing with bewitchment. One method of ending the trance was communicated to the parents during Mary's first trance, when the voice of the *curandera* was heard. The parents were told to dab alcohol three times on the palms of Mary's hands, then to put salt[3] in the form of a cross on her palms and forehead and on the back of her head, and with each application to say three times the magical "With the hands of Ma (mother) Teresita Hernandez (the *curandera*) and in the name of the Father, Son and Holy Ghost, you are in our hands now and everything is well." The last instruction, which the parents carried out, was to slap the patient hard once on each cheek and tell her to waken. The mother stated, "We were told that if you show her any sympathy nothing will happen!"

Other methods used were to place a rosary in the patient's right ear and call her name three times, to take branches which had fallen on graves, and then place one branch at the foot and head of the bed, and to beat her with another branch during the trance while saying the incantation mentioned above. Perhaps the most effective method, which was used on several occasions, was that described by her stepfather. This method was used mainly when Mary would try to scratch either of her parents. He stated he held her shoulders and then "jumped on top of her to keep her from scratching me. I held her tight and close and then threw my whole body on her and held her close to me for about ten minutes." After this Mary would come out of her trance.

For several days prior to and immediately after Mary's admission to hospital she had a peculiar head bobbing which she claimed was caused by Aunt G.'s pulling her hair. This went on all day, but did not seem to disturb the patient (*belle indifférence*), although she stated that her hair

[3] The use of salt to counteract a spell must be noted. This substance has been used throughout history by many peoples to nullify the effects of bewitchment, and Jones (9) feels that this is mainly because it symbolically represents semen, a magical fluid.

burned where it had been cut, and she also noticed that every time she washed her hair the water turned yellow, which she thought signified that her hair was bewitched. This behavior ceased when the visits of the parents were temporarily stopped.

The mother also claimed to be bewitched, but only indirectly through her daughter. Mrs. H. stated that Aunt G. was definitely a *bruja*, and that she had taken lessons in Mexico for over 15 years. Several years earlier she had seen Aunt G. engaged in witchcraft: cutting her brother's wedding picture in half, thus separating the bride from the groom. (These two did in fact separate soon afterward.) Mary confirmed that Aunt G. practiced witchcraft, and said she had once seen her aunt change a bar of soap into many shapes.

Mrs. H., with her husband, sat by Mary's bedside every night during the month of her trances, and during this time the parents reported some rather strange things happening. For example, from the night of Mary's first trance the whole family noticed a large black cat which came into the kitchen after sundown, sat on the refrigerator and stared at them. To keep the cat from coming into the living-room Mr. H. threw salt across the kitchen doorway and said a prayer. Also, they noticed in the window a pair of big red eyes which watched everything they did.

Regarding Mrs. H.'s *embrujo*, she noticed that soon after her daughter's trances she began to feel jealous. Once while in the house she stated she saw a man dressed in black who told her that her husband and daughter were making love in the kitchen. Another time she went to an outside toilet and heard a voice say, "Why did you leave them alone? They're making love."

Two of the most alarming events for Mrs. H. occurred after she dozed off to sleep, while Mr. H. sat by the bedside watching over Mary. Mr. H. stated that on the first occasion he suddenly became aware of someone behind him, and veered around to see his wife about to strike him. She had arisen from her sleep and approached him with her hands clawed and her eyes "big and red." Just as she was about to lunge at him she said, "I knew this was going on between you and Mary," but in the nick of time he managed to toss some salt on her and she immediately came out of her spell. Mrs. H. did not remember stalking her husband, but did remember that in her sleep the "devil man" and Aunt G. told her that her husband and Mary were making love, and that "they wanted me to kill him." The mother blamed this event on her going to bed before midnight, saying that if a person goes to bed before midnight when there is a bewitched person in the house the sleeper is rendered more vulnerable to possession by evil spirits. A similar incident occurred soon after, but this time she said, "I knew something like that was going on between you and Mary—you pay more attention to her than to me."

Aside from observing the weird events in the household, Mr. H. was terrified by several of his personal experiences. On three occasions when he and his wife were sitting by Mary's bed watching over her while she slept, Mrs. H. noticed that her husband seemed to be in a trance, his body slowly rocking to and fro. She could see him gradually "change into a yellow cat from the neck up." Rather startled by this, she treated him in the only way she knew, *i.e.*, by throwing salt on his face and saying a prayer. He then changed back to his original self. Mr. H. confirmed his feline metamorphosis by observing that, in these three instances, he was aware that his face was getting tighter, and that his skin felt "too tight for my face." He was also aware of difficulty with speech, and almost seemed to be purring.

A few days after Mary was admitted to hospital Mr. H. related a frightening experience he had had the night before. He had been sleeping next to his wife when, for

some unknown reason, he wakened and put his hand on her breast and then on her belly. What he felt shocked him: instead of his wife's rotund belly with its grapefruit-sized umbilical hernia, he felt a flat, firm belly that he knew to be Mary's. Disturbed by this, he withdrew his hand, buried his face in his pillow, and tried to convince himself that all this was just a dream. Having temporarily convinced himself, he again laid his hand on his wife's belly, with the same result. This time, with less trepidation, he looked at his wife's face but saw Mary's face instead. He then rubbed the belly and said a prayer; gradually the belly started to rise, the hernia popped up, and his wife was lying beside him again. Much relieved, he turned over and went back to sleep.

With regard to Jones's thesis (10) (that the fear of bewitchment can be equated with the fear of impotence), Mr. H. was questioned on his sexual behavior during this period. To our surprise, he stated that since all this trouble started, rather than a decrease in sexual libido, he had felt his sexual desires heightened and had been having sexual relations with his wife twice a night![4]

A short description of Aunt G. should be given, since she plays such a major role in the family's difficulties. Aunt G. was an ugly, sloppy middle-aged woman with disheveled hair and crooked teeth. She was extremely guarded and suspicious in talking to the authors, and although she admitted to cutting Mary's hair, she protested even before we questioned her that she knew nothing of witchcraft. One report described her as "a very worthless human being, a slob, a wino." She was reportedly the mother of 14 children, most of whom had had to be given to various agencies because of her incompetence and neglect. She was not certain who had sired several of her children.

[4] Fear of impotence can be associated with sexual over-activity.

DISCUSSION

Although much information has been excluded, we have attempted to give the most essential data. It is our thesis that with all persons involved in this family, their bewitchment, similar to other hysterical symptoms, served as a substitutive gratification for their individual and mutual unconscious strivings. In other words, the *embrujo* represented for Mary and her parents both the expression of an unconscious impulse and the defense against it. We also feel that *embrujo* was not only the most logical outcome for their problems, but was also an effective way to discharge their unconscious impulses, and one that was consistent with their individual psychologic substrates.[5] It is also felt that these trances represent hysterical states, affording each person the opportunity to express a repressed part of his psyche without having to experience guilt for his emotions, since the *bruja* was blamed for everything.

Although the term "bewitchment" has been used rather loosely throughout this paper, we have not distinguished between two other states of witchcraft, "possession" and "obsession." Bewitchment, in the strict sense of the term, refers to some agent (*bruja*) who casts a spell over or charms someone else. This may be done by incantations, but the more usual ways are by the use of "contagious" or "imitative" magic (4). With contagious magic, some discarded part of the person to be affected is used, such as nail parings, hair and excrement,[6] and the imprecations are said over these parts. With this type of magic, a part of a person represents the whole person (*pars pro toto*).

Imitative magic utilizes the concept that

[5] Freud (6, p. 437) has observed that "what ... were thought to be evil spirits, to us are base and evil wishes, the derivatives of impulses which have been rejected and repressed."

[6] It seems probable that this high degree of cathexis directed toward these relatively insignificant body parts can represent a displacement from the highly cathected sex organs (2).

anything which resembles something else may be equated with the thing that it resembles. This means that an effigy doll would, in effect, stand for the person it resembled, and anything done to the doll would in turn affect the person. In Mary's case, we see a combination of both imitative and contagious magic used in her bewitchment, since not only was an effigy doll used, but her hair was also attached to it. Bewitchment may also take the form of direct control over another by "fascination" with the "evil eye" (*mal ojo*), without using either of the above types of magic (8). It should be noted that these forms of magic are not merely cultural or anthropologic curiosities, but are also seen in the thinking and behavior of schizophrenics (14), and in unconscious productions of normal and neurotic persons.

The state of "possession" is different from the forms of bewitchment, in that no outside person is held responsible. In possession, the devil or some demon enters the body or mind of a person and proceeds to direct his behavior, although some element of conflict may remain (6, 10, 12, 17). An excellent description of this state is given by Henry James in *The Turn of the Screw*. Diabolical possession was the form of witchcraft for which people were most usually executed during the Middle Ages, and although it is not commonly seen in psychiatric settings, a recent paper (19) reported that 2.4 per cent of all admissions to the Hong Kong hospital enter with the "possession syndrome." The *Rituale Romanum* (13) lists the three signs most characteristic of a possessed person: 1) the ability to speak many words of an unknown language, or to understand them; 2) the ability to reveal hidden or distant things, and 3) a manifestation of strength beyond one's age or natural condition.

The third main effect of witchcraft is the state of "obsession," in which a person is continually tempted by the devil or some demon to commit some act (*e.g.*, sexual). Once the person succumbs his soul is forfeit, and he passes over into the state of "possession" (10). Cases of obsession may last for a short while or may plague a person throughout his life (17).

We should stress the major role of the "omnipotence of thought" in these people in the formation of their "bewitchment." Not only does the omnipotence of thought play a role in their belief in magic, but also their primitive outlook equates any unconscious feelings or thoughts with the satisfaction of their wishes (5). This, in turn, puts a demand upon their egos immediately to defend the conscious mind from these thoughts through repression. Once this defense mechanism fails, their psyches are ripe for *embrujo*.

Regardless of the degree to which Aunt G. acted the part of *bruja*, the crucial element was the family's firm belief (16). We can assume that belief in one's bewitchment is synonymous with bewitchment. The dire effects of such a belief have been noted in cases of voodoo death (1).

Focusing now on the family's dynamics, we find that their state of bewitchment served as a channel through which unconscious, incestuous Oedipal feelings as well as oral needs could be expressed. For this to occur most effectively, Aunt G. was brought into the picture as the *bruja* responsible for all of the family's woes. Whether or not Aunt G. considered herself to be a *bruja*, her description would fit the prototype of a witch in any culture, or at any time in history. She exemplified the bad mother figure *par excellence*, not only in her extreme promiscuity but also in her lack of affection and care for her children.

What we observe here seems common to all cases of witchcraft, *i.e.*, that the devil and witch represent the bad father and mother, respectively. Freud (6) states: "The antitheses contained in the original idea of the nature of God are but a reflection of the ambivalence governing the relation of an individual to his personal father.

... The father is thus the individual prototype of both God and the Devil." A similar analogy—comparing the witch to the bad-mother aspect of ambivalence toward the mother figure—is made by Jones (10). Thus, aside from the obvious Oedipal situation, we find an oral schism between good and bad mother for all of the persons involved—an aid in the handling of ambivalence.

With this in mind, we find both Oedipal feelings and oral mechanisms contributing to the state of bewitchment. Mary's mixed feelings toward her mother derive from viewing her as an obstacle in conceiving a baby by her stepfather, and also represent the frustration and anger she feels toward her mother for not fully gratifying her oral dependence needs. Since these feelings are intolerable to Mary's consciousness, she culls the unacceptable feelings toward her mother and displaces them onto the aunt, whose attributes make her the perfect scapegoat. Mary must deny the accusation that her mother is a "whore," since it was also predicted that Mary would grow up to be like her. Being a "whore," in Mary's mind, is equated with having relations with the stepfather, which is horrendous. Therefore, Aunt G., who has all the qualities that Mary wishes to deny in her own mother, symbolizes not only the evil mother on whom she can vent all her hostility, but also a person to whom she surrenders for gratification of her Oedipal strivings. In effect, then, Mary says, "For whatever is bad in me, my bad mother [Aunt G.] must take the blame—I am not responsible for my sexual feelings toward my stepfather or my hostility toward my mother."

It is interesting to note the evolution in content of Mary's trances, and all of the unconscious wishes represented therein. The first series of trances with the effigy doll may represent the abuse she received from the "bad mother." In the trances that followed the effigy doll was thrown into cold water and then placed in the grave. In the light of Mary's life experience, we feel that these trances represent strong regressive longings (return to the womb). The graveyard scenes with Aunt G. could represent death wishes toward the "bad" part of her own mother and herself. The trances again change, Aunt G. placing her in a hole, her stepfather "pulling her out of the hole." Here we seem to find evidence of Mary's unconscious regression-rebirth fantasies, and also the resolution of both her dependency needs and her incestual longings, whereby not only would the stepfather get her pregnant, but also the baby conceived by him would be herself. This rebirth fantasy is borne out in the subsequent trances, when a baby's cry was heard in the distance, after which Mary "took the baby's mind." The baby, in fact, represented Mary.

Incestuous fantasies become more apparent in the succeeding trances. Aunt G. hides behind a monument and seems to tempt Mary. Mary feels that if she accepts the temptation her soul will be lost. The temptation, in this case, appears to represent not only her incestuous feelings but also the death wish for the mother (symbolized by the monument). A more blatant expression of her desires follows, when Mary seems pregnant and enacts a pseudo-labor during her trances. Through the intervention of Mr. H. she is to be reborn, perhaps to a better, conflict-free existence; however, the gratification of her unconscious fantasies can go only so far before the reality principle enters and Mary awakens. Just as Oedipus could not bear the guilt for his deeds and had to blame Fate, Mary had to blame Aunt G.

The role of the stepfather in the perpetuation of these trances is interesting. Not only does he respond to Mary's unconscious desires by lying on top of her under the conscious pretense of preventing her from scratching the mother, but he satisfies his own unconscious longings as well. This hypothesis is confirmed by the rather undis-

guised wish-fulfillment illusion, when he imagines Mary lying beside him in bed.

The mother also plays a major role in the family's affliction. It seems certain that she views her daughter as a rival, and her thwarted attacks on her husband during dissociative states show the intense jealousy and rage she harbors because of the fear of his possible desertion.

We can only surmise the precipitating cause of the family's bewitchment. For Mary, the time was certainly ripe for bewitchment. Torn between her marked dependency needs and her incestuous longings, she found bewitchment an answer to both, since she could not only express her sexual longings in her trances, but could also have the secondary neurotic gain of both her parents feeling very concerned about her. It appeared that when Mary's unconscious began to express itself, free unconscious communication took place among all of the persons involved. The expression of Mary's unconscious impulses seemed to set up a chain reaction in her parents, so that their previously forbidden unconscious impulses could be expressed in the form of hysterical states.

In conclusion, we feel that the family's Oedipal feelings could not have been expressed in their mutual bewitchment without a fourth person (Aunt G.) to blame for their unconscious impulses. With this family's background, beliefs and psychopathology, even if a witch had not existed, one would have had to be created (*S'il n'y avait pas un diable, il faudrait l'inventer*) to serve as the key to unlock, and thereby partially discharge, their unconscious sexual feelings.

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A COMPARISON OF THE PERFORMANCE OF STUDENT NURSES AND PSYCHIATRIC PATIENTS ON THE EDWARDS' SD SCALE

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Recent studies have yielded convincing evidence that a "social desirability" factor operates in a subject's responses to objective personality tests, and much interest has been stimulated in the possible relationships between this factor and psychopathology. Fordyce (4) describes this social desirability concept as measuring conformity to "consensus judgments as to what behavior, feelings, and attitudes win social approval in American society."

In a study by Klett (6) in which the 140 items of the Edwards' Personal Preference Scale were rescaled by hospitalized male psychiatric patients, it was found that no essential differences existed between psychotics and non-psychotics in their judgment of social desirability. In this investigation, however, there was no differentiation with regard to specific nosologic categories. More recently, Klett and Tamkin (7) further investigated the influence of psychopathology upon the social desirability stereotype, endeavoring to use more sensitive measures of psychopathology. Three special scales from the MMPI were employed to measure the extent of emotional disturbance in their subjects, and they concluded from their results that whether social desirability is related to degree of pathology is "problematic."

PURPOSE

The present study was undertaken to determine whether there are significant differences among specific diagnostic groups and a clinically normal control group on the Edwards' 39-item social desirability scale (3). Further, an effort was made to investigate the relationship between the social desirability factor and the severity of illness within a diagnostic category. The effect of anxiety upon the SD variable was also examined.

METHOD

The SD scale was administered to 94 hospitalized psychiatric patients and to a group of 60 female nursing students. Making up the patient population were 40 schizophrenic patients, 20 patients diagnosed as neurotic, 20 passive-aggressive personalities, and 14 sociopathic personalities. There were 48 males and 46 females in the group, ranging in age from 15 to 62. Earlier studies have shown that the variables of age and sex do not significantly affect judgments of social desirability (2, 6), so these factors were not controlled. At the time of testing an anxiety rating for each patient was obtained from the therapist, who indicated the degree of the patient's anxiety on a four-point scale ranging from mild to intense. For the purpose of this study, anxiety was used in the clinical sense—as a state of emotional tension characterized by vague apprehension and uneasiness. Category 1 indicated a minimal amount of anxiety, expressed almost entirely on a covert level. Categories 2 and 3 reflected increasing amounts of anxiety, present in overt and covert forms. Category 4 represented marked and directly manifested anxiety.

In an effort to determine whether social desirability is related to extent of pathology, the schizophrenic patients were rated additionally on the Institute of Living Clinical Rating Scale (9). This is a scale developed to evaluate the clinical status of schizophrenic patients by rating various areas of the individual's mental life and behavior, and it permits the calculation of a global score reflecting the severity of the

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illness. With recognition that the schizophrenic diagnostic category in itself is an indication of the degree of pathology, the rating scale scores obtained by the schizophrenic patients were used to ascertain differences in severity of illness within this group, and to determine whether this was related to social desirability.

RESULTS

The mean SD scores and standard deviations for the patient groups and the nursing students are presented in Table 1. An analysis of variance yielded a non-significant F of 1.38, indicating that there is no overall difference among the patient groups with respect to their SD scores.

Comparisons of the four groups considered two at a time, using *t* test analyses, again yielded no significant differences. However, when the schizophrenic patients were contrasted with the non-psychotic patients combined into one group, a *t* value of 1.96 was obtained, which approaches significance ($p < .10$). The total patient group was compared with the nursing students and the *t* value of 1.69 also approached significance ($p < .10$). These results are summarized in Table 2.

TABLE 1

SD Means and Standard Deviations in Four Patient Groups and Student Nurses

Groups	N	Means	SD
Schizophrenics	40	24.9	7.59
Sociopaths	14	28.6	6.70
Neurotics	20	27.1	6.14
Passive-Aggressives	20	27.6	6.39
Total Patient Group	94	26.5	6.97
Student Nurses	60	28.3	5.50

TABLE 2

Results of t Tests Between Patient Groups and Between Nurses and Patients

Groups	N	SD Means	*t*	*p*
Non-psychotic	54	27.7	1.96	0.10
Psychotic	40	24.9		
Total Patient Group	94	26.5	1.69	0.10
Nurses	60	28.3		

A chi-square analysis of the 39 items comprising the SD scale was done to see whether any specific items discriminated between the groups. The various groups of patients and nurses were taken two at a time, and 468 comparisons were made. Of these, 68 item discriminations were significant at the .05 level or better. By Sakoda's graphs (10), the probability of obtaining this number of significant results is less than .001, and therefore cannot be explained on a chance basis. The significant items are listed in Table 3 by item number. Those items which elicited no significant differences in any of the 12 group comparisons are omitted.

To determine whether there was a relationship between severity of illness and the SD score within the schizophrenic group, a Pearson product-moment correlation was computed for the SD scores and the clinical rating scale judgments. The resultant *r* of .283 lies between the .10 and .05 level. As an additional test, and with the median as a cut-off point, high and low SD scores were compared with high and low clinical rating scale appraisals. The chi-square obtained from this breakdown did not indicate a significant association between SD and pathology rating.

For the total patient group, the relationship between the amount of anxiety and the SD score was analyzed, again using chi-square. The patients receiving anxiety ratings of 1 or 2 were combined and designated as the low anxiety group, while those rated as 3 or 4 were considered to be the high anxiety group. With the median SD score as a dividing point, a chi-square value of 3.89 was obtained, significant at the .05 level. Thus, the greater the patient's anxiety, the fewer the items he will answer in the socially desirable direction.

TABLE 3

SD Scale Items Which Discriminated Between Nurses and Patient Groups

Items	Group Comparisons*											
	P-N	Soc-PA	Soc-Neur	Soc-N	Soc-Sch	Neur-N	Neur-Sch	Neur-PA	N-Sch	Sch-PA	PA-N	Sch-NP
1			0.05									
3												0.05
4							0.05					0.02
5	0.001	0.05		0.001					0.001			
6	0.01			0.02		0.01						
7									0.01			
8	0.01				0.05	0.01			0.001	0.02		0.02
9	0.02					0.05					0.01	
11												0.05
15		0.01										
16									0.02†			
18			0.01			0.01†	0.01					0.02
19	0.01			0.01					0.001		0.05	
20	0.01			0.01		0.001			0.05			
21									0.05			
23	0.01								0.01			
24					0.05		0.01					0.01
26		0.05									0.01	
27	0.001					0.001			0.001		0.05	
28	0.01†		0.05	0.001†	0.05				0.02†		0.05†	
30	0.01					0.02			0.01			
34	0.001†					0.05†			0.01†		0.01†	
35					0.05							
36	0.02†								0.05†		0.05†	
37		0.05								0.05†	0.05	

* P = Total patient group
† Reversed direction of discrimination
N = Nurses
Soc = Sociopaths
PA = Passive-aggressive personality
Neur = Neurotics
Sch = Schizophrenics
NP = Non-psychotic patient group

DISCUSSION

The findings of this study are consistent with those of Klett in pointing to a "problematic" rather than a definitive relationship between psychopathology and SD scores. While the *t* values approach significance in the comparisons of the psychotic and non-psychotic groups, and the nursing students and the total patient group, these results are suggestive rather than conclusive.

Of interest in the present findings was the significant relationship between the amount of anxiety and the SD score. A recent study by Crowne and Marlowe (1) is pertinent. They noted a high negative correlation between the SD scale and the Taylor Manifest Anxiety Scale, and between the SD scale and the Welsh A Scale. In the latter scale, high scores were found to be related to disabilities where anxiety was prominent. The consistency of these results raises the question of whether the SD scale is more a measure of anxiety than of social desirability. Crowne and Marlowe believe that the Edwards' scale measures social desirability only "in the very restricted sense that it is bad or undesirable to have or admit to symptoms," and that such attitudes are not necessarily related to other test behavior or social behavior.

An analysis of the items of the SD scale showed that the greatest number of item discriminations (13 and 12, respectively) occurred in the comparison between the patient group and the nurses, and between the nurses and the schizophrenics. Three of the 12 items which differentiated significantly

between the nurses and the patients were answered in the reverse or unexpected direction by the nurses. Two of these—"I feel hungry almost all of the time" and "I am easily embarrassed"—probably attest more to the adolescent age period of the nursing students than to pathology. The content of the discriminating items revealed a subjective sense of strain, unhappiness and apprehension which characterized the patient group, and a sensitivity to criticism and fault-finding in others. A comparison of the neurotic and passive-aggressive groups showed no items which differentiated between them, indicating that these groups are not significantly different with respect to the admission of symptoms.

When the schizophrenic patients were contrasted with the non-psychotic patients, six items were found to discriminate between these two groups. Only one of these items—"I am happy most of the time"—was a duplication of those items which differentiated between the nurses and the total patient population. Three of the statements are of particular value in differentiating the schizophrenics from other groups, since they were significant either in this comparison only, or in one additional comparison. These particular items—"I find it hard to keep my mind on a task or job," "Most any time I would rather sit and daydream than do anything else," and "I have periods in which I carried on activities without knowing later what I had been doing"—reflect the disruption in concentration and the disturbed reality contact of the schizophrenic group.

The two items which discriminated most often among the groups, achieving significance in six of the 12 comparisons, were "I am happy most of the time" and "I am easily embarrassed." However, this latter item was often subject to reversals, and was usually significant because of the nurses' tendency to answer it in the wrong direction. Similarly, the discriminations made by the item, "I feel hungry almost all the time," were all in the reverse direction, and this statement reached significance only in the comparisons made with the nurses.

SUMMARY

The purpose of this study was to determine whether differences occur among various diagnostic groups and nurses on the Edwards' social desirability scale. The relationship was also investigated between the social desirability factor and the severity of illness, and the effect of anxiety upon the social desirability variable.

Edwards' 39-item social desirability scale was administered to a group of 60 nursing students and 94 hospitalized psychiatric patients. The patient group included schizophrenics, neurotics, sociopathic personalities and passive-aggressive personalities. No significant differences in total SD scores were found among these groups. However, comparisons of the non-psychotic with the psychotic patients, and the total patient group with the nursing students, revealed differences in SD scores which approached significance ($p < .10$). An item analysis of the 39 statements comprising the SD scale yielded significant group differences as well.

When each schizophrenic patient was evaluated on the Institute of Living Clinical Rating Scale for the severity of illness, the correlation obtained between these ratings and the SD scores was .28 ($p < .10$).

A significant negative relationship was found between the SD scores of the total patient group and the amount of anxiety as measured by a four-point scale completed by the therapist at the time of testing. The relationship between this finding and the results of other investigators is discussed.

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BRIEF COMMUNICATION

CLINICAL TRIAL OF METHASTYRIDONE (MK-202) WITH CHRONIC ANERGIC SCHIZOPHRENICS

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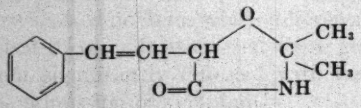
Methastyridone (2-Dimethyl-5-[2-phenylvinyl]-4-oxazolidinone) is a new drug furnished as MK-202, with the following structural formula:



Methastyridone (MK-202)

Extensive experiments on operant behavior of rats, dogs and monkeys[2] have demonstrated low toxicity, anti-fatigue action, and the stimulation of appropriate behavior without increase of inappropriate behavior. MK-202 appeared to exert its stimulant effect by a mode of action probably different from that of d-Amphetamine and certainly unrelated to monoamine oxidase inhibitors and imipramine.

These findings seemed to warrant a trial of MK-202 with regressed, apathetic, chronically anergic psychotic patients. Accordingly, 17 hospitalized white females were selected, with ages ranging from 37 to 70 (mean, 55.2). Their length of hospitalization on one of the chronic services at Spring Grove State Psychiatric Hospital ranged from one to 31 years (mean, 18.5 years). During the three-month period before being started on MK-202, nine patients had had no drug therapy; the remaining eight had been treated with one or more of the following drugs (with minimal results): Compazine, Prolixin, Ritalin, Stelazine, Thorazine, Vesprin. Six of the eight patients receiving these drugs had been without drug therapy three to ten weeks before being started on MK-202; the remaining two patients had had no pre-trial drug-free period.

The clinical investigator and a psychologist observed each patient for several weeks prior to the trial treatment. Individual clinical descriptions were written, with emphasis on target symptomatology, nature and degree of affect, psychomotor retardation, participation in ward activities, and relationships with patients and personnel. The typical patient was described as untidy, withdrawn, neglectful of personal needs, and extremely inactive. Behavior was limited largely to sitting or lying down, engaging in purposeless movements, or aimless wandering around the ward.

All patients were treated with MK-202 in tablet form on the following schedule: 250 mg. twice a day for the first week; 500 mg. twice a day the second week; 250 mg. three times a day the third week; 250 mg. four times a day the fourth week; and 500 mg. three times a day for the fifth and final week. Weight, pulse rate and blood pressure were recorded weekly. White blood count, hematocrit and sedimentation rate were recorded bi-weekly.

The clinical team (investigator and psychologist) saw each patient for a brief interview several times weekly during treatment and during an additional follow-up drug-free period for eight weeks thereafter. Using each patient's initial clinical descrip-

[1] Research Department, Spring Grove State Hospital, Baltimore, Maryland. Appreciation is expressed to Merck Sharp & Dohme Laboratories for supplying the drug and for financially supporting the study; to Friends of Psychiatric Research, Inc. for administrative assistance, and to Dr. Bruno Radauskas for making clinical facilities available.

[2] Merck Institute: MK-202 Preclinical Evaluation. West Point, Pennsylvania: Merck & Co., Inc., 1960.

tion as a baseline, the psychologist rated change at the end of treatment on a five-point scale: marked improvement, moderate improvement, minimal improvement, no change, or worse. No attempt was made to carry out a double-blind or controlled study, since the investigation was purely exploratory—to determine whether the drug had any stimulating effect in this category of patients.

After five weeks on MK-202, no patients were rated markedly improved, moderately improved or worse. Four patients (24 per cent) were minimally improved; the remaining 13 were unchanged. The main changes observed in the four minimally improved patients were in the direction of less purposeless activity, less untidiness, less autistic verbalization, and more social participation. It should be stressed, however, that all changes were so limited as to be barely within the range of confident observation; their relevance to drug response *per se* remains uncertain.

To test a more intensive dosage schedule, six of the original 13 patients were given, without interruption, a further 35-day course of MK-202, as follows: 250 mg. twice a day from day 1 to 4; 500 mg. twice a day from day 5 to 8; 500 mg. three times a day from day 9 to 12; and 500 mg. four times a day from day 13 to 35. For all six patients, response at the end of the second trial (as compared with pre-treatment condition) was rated the same as for the first trial: two patients were still minimally improved, and four remained unchanged.

Possibly the degree of regression and chronicity of the patients in this trial may have been a serious limiting factor in drug response; however, within the limits of these essentially negative results on a small sample of patients, a few trends were noted which might be retested in future studies of MK-202. As compared with the unimproved patients, the few who improved minimally tended to be older (mean age, 59.8 vs. 53.8 years), and to have spent less time in the hospital (mean age, 14.5 vs. 19.8 years). In addition, three of the four improved patients had been drug-free for at least three months before being started on MK-202, whereas in the unimproved group only six of 13 patients had been without drugs for the same period. This difference, significant at the .05 level, suggests that the improvement rate for MK-202 might have been higher had it been possible to include in the study more patients who had not recently been receiving tranquilizing drugs.

No complications during treatment could be specifically attributed to the drug. In some patients there was a gradual loss of weight unassociated with any change in pulse, blood pressure or therapeutic response. One patient who had had occasional edema prior to treatment developed it again while on MK-202. Another became jaundiced one month after the end of treatment, and a diagnosis of hepatitis was made; subsequently she died and an autopsy indicated myocardial infarction as the cause of death. In a third patient a reduction in white blood count was noted, with return to her normal level while still on medication.

SUMMARY

A group of 17 regressed, anergic female psychotic patients residing on a chronic service in a state psychiatric hospital were treated experimentally with a new drug, Methastyridone (MK-202). With the study focused on the target symptomatology of inactivity, no significant therapeutic results were observed. No complications attributable to the drug were noted.

CLENDENING, LOGAN, ED. *Source Book of Medical History*. Dover, New York, 1960. Originally published in 1942. Paperbound. xiv + 685 pp. $2.75

The scope of this book is well summarized in a statement on the cover: "124 papers covering great discoveries in anatomy, diseases, materia medica, anesthesia, bacteriology, clinical medicine, modern therapy, preventive medicine, pathology, physiology, and medical life."

In form there is a brief historical note by the compiler, followed by excerpts from the original paper. Of particular interest to the neurologist and the psychiatrist are contributions by Pinel, Tuke, Charcot, Parkinson and Romberg.

The book affords glimpses into many interesting aspects of medical history, and should stimulate further inquiry into those fields of special interest to the reader.

W. W. Elgin

DEGUTIERREZ-MAHONEY, C. G. AND CARINI, ESTA. *Neurological and Neurosurgical Nursing*, 3rd ed. Mosby, St. Louis, Missouri, 1960. 413 pp., illus. $6.50

This basic text, dealing with neurologic and neurosurgical nursing, was written by a neurosurgeon and a nurse. It could be used most effectively as a textbook for beginning nursing students or as a general sourcebook. The third edition has been revised to include recent advances in diagnostic and surgical procedures.

The introduction provides a succinct, thorough overview of the history of neurology from 1840 to the present, with emphasis on trends and changes, and the achievements of notable figures in medicine, surgery and nursing. The authors expertly point out the relationships between anatomic structure and clinical manifestations of disease and trauma. The fundamental clinical picture of neurologic dysfunction depends upon the location of the lesion, and is the same regardless of the cause.

Those portions of the text dealing with the patient as a physical entity, or with specific tests, procedures or operations, are detailed, adequate and clear. For example, a concise outline for the observation of seizures is contained in the chapter on convulsive disorders, and the chapters on specific categories of disease and trauma, and surgical therapy, are very well illustrated.

One major area has been treated ineffectively and inadequately—that of the nurse's role as counselor. The nurse is reminded from time to time of the patient's "emotional needs," and cautioned to act in a way to cause the least amount of psychic trauma, but precisely how is not elaborated upon. Interpersonal theory and relevant psychiatric concepts are lacking.

The other area that detracts from the validity of this text is the restricted view of psychosis and the use of psychoanalytic or psychotherapeutic techniques in neuropsychiatry. The impression given is that surgical procedures are often the only recourse in mental illness. Inclusion of a broader view of psychiatric therapies and interpersonal relations in nursing would have added greatly to the usefulness of this work, since most neurologic and neurosurgical textbooks do not yet include such integration of interpersonal techniques.

Shirley Anne Smoyak

COLE, JONATHAN AND GERARD, RALPH, EDS. *Psychopharmacology: Problems in Evaluation*. Publication No. 583, National Academy of Sciences—National Research Council, Washington, D. C. 1959. xvii + 662 pp., illus. $6.50

FEATHERSTONE, ROBERT M. AND SIMON, ALEXANDER, EDS. *A Pharmacologic Approach to the Study of the Mind*.

Thomas, Springfield, Illinois, 1959. xxviii + 399 pp., illus. $10.75

The question should be asked, How many additional monographs on psychopharmacology will the market absorb? Although it is an extensive and intensive field of multidisciplinary research, this reviewer feels that a limit is being approached for the production of books iterating the presented papers and discussions of the many lengthy conferences on this subject. Quite obviously, many of the participants are perennial performers, and the frequency and size of these conferences are exceeding the increment in new research. Properly, almost every one of the dozen-odd major conferences published since the recent inception of this field has been the integrated effort of workers in all fields; thus, the justification of a different point of view for so many meetings is lacking.

To raise the question of utility for the first publication, *Psychopharmacology: Problems in Evaluation*, is unfortunate in that this was one of the earliest conferences on the subject, and has also proved to be one of the best. The conference was held in September, 1956, and was sponsored jointly by the National Institute of Mental Health, the National Academy of Sciences-National Research Council and the American Psychiatric Association. Its publication, however, was inordinately delayed (until 1959), causing it to lose much of its value as a guidebook to those entering this field of research during this period.

One of the outstanding features of this first meeting was the preconference preparations. These plans, which are reviewed in Gerard and Cole's introduction, might well serve as a model. The prior exchange of papers permitted the participants to come to the actual meetings prepared to supply carefully developed comments, rather than impromptu, shallow and hasty opinions.

Seven review papers constitute the initial summarization of the status of the problem from varied viewpoints. This material, however, antedated the conference by almost a year. The next large section deals more specifically with methodologic problems—from neuropharmacologic, electrophysiologic, neurochemical and pharmacologic standpoints to several varieties of behavioral study. Problems of the initial trials in the clinical screening of drugs are also considered.

The balance of the work is primarily psychiatric in nature, and considers the selection of patients and controls, the testing environment and the evaluation of results. Even today, many of the difficult problems outlined here lack adequate solution. Although a large number of the tactics described in this volume are now standard practice, the book affords a valuable review of the numerous problems which need to be sifted again by each new investigator.

The second conference, *A Pharmacologic Approach to the Study of the Mind*, was held January 25–27, 1959, and was published in the same year. The conference was sponsored jointly by the Department of Pharmacology of the University of California School of Medicine and the Langley Porter Neuropsychiatric Institute. This conference was much less tied to methods than was the first, being more a conceptual analysis of theories and progress in psychopharmacology. It embraced all three of the principal drug groups: ataraxics, psychotomimetics and antidepressants. The advantage of the exchange of manuscripts before the conference was not apparent, as was the case in the first book.

On analysis, the section on antidepressant drugs, which represents the most recent area of psychopharmacologic research, does not seem to deal with the subject in an overall manner. The data presented deal most fully with JB-516 (Catron), a monamine oxidase inhibitor formerly marketed by a financial supporter of the conference. The review of therapy with psychic energizing drugs by Kline in this section is perhaps the best of the group.

Aldous Huxley, the featured dinner speaker of the meeting, contributed an adaptation of his recent book, *The Final Revolution*, in which he considered the implications of the hypothetic tranquilizer "SOMA," and appraised the role of drugs in an increasingly technocratic society.

Edward B. Truitt, Jr.

ROSTAND, JEAN (translated by Pomerans, A. J.). *Error and Deception in Science.* Basic Books, New York, 1960. 196 pp. $4.00

This book is a collection of essays by the famous French experimental biologist. The first of these, from which the book takes its title, comprises an illuminating and altogether delightful exposition of the pitfalls into which scientists, and especially biologists, sometimes blunder. The author prefaces his essay with the quotation of a engaging story from Fontanelle's *Histoire des Oracles*, about a Silesian child of the sixteenth century who had a gold tooth about which scholars had written several explanatory treatises before it was discovered that the tooth was a fraud artfully contrived with gold leaf. He then shows how, even in the present century, not only individual scientists but also whole groups have been led astray by preconceived ideas. He recounts how a large number of scientists of highest repute were taken in by the theory of N-radiation. N-rays were "discovered" by a professor of physics who, while working with X-rays, came across "new rays that were quite distinct from X-rays and which, unlike the latter, could be polarized." Previously he had ascribed polarization to X-rays. Now, having "identified" N-rays, he looked for and found them in other radiations. Interest spread rapidly, and in due course the rays were detected as a product of muscle activity and even of "pure mental exertion." "An imposing edifice of positive facts of far reaching effects not only in physics, biology and medicine but in all the theoretical and applied sciences" was built up. But two years after its inception this whole edifice came tumbling down, having been exposed as a massive body of self-deception. Rostand points to some modern instances of this kind of unrigorous thinking, *e.g.*, Michurin biology. If he had turned to the field of psychiatry he would have found other instances. The same bell tolls for the psychoanalytic schools.

The other essays present a tremendous amount of biologic information in a manner that is terse, level-headed, well organized and palatable. All topics—and they include the genetic and developmental factors that influence human variability and determine many kinds of maladjustment, biology and the law, and the use of the cinema in propagating biologic knowledge—are approached from a firmly deterministic position. The author takes considerable pains to justify determinism, both by pointing to its advantages and by answering its critics. For example, he points out that, though determinists are not concerned with questions of responsibility and merit, they can, nevertheless, express moral judgments. . . . "Virtuous actions are loved and admired, and evil actions are decried, no matter if they are performed freely or otherwise." In passing, a great many vague and scientifically unsupported speculations are rebutted. For example, Rostand points out the incompatibility with biology of the contention of Sartre that man is what he is, not because of his physiologic organization or even because of his environment, but simply because he has "constructed himself" by his own actions.

The translation from the French has been done very well. Altogether, the book is strongly recommended.

Joseph Wolpe

COHN, ROBERT. *The Person Symbol in Clinical Medicine: A Correlation of Picture Drawings with Structural Lesions of the Brain.* Thomas, Springfield, Illinois, 1960. 196 pp., illus. $10.00

It has been Dr. Cohn's practice for many years to do a complete neurologic evaluation of every patient referred to his laboratory for electroencephalography. As the reviewer knows from personal observation, these studies are thorough and have been carefully recorded. For several years Dr. Cohn has included in his combined examination the test of having the subject draw a picture of a person. In this book he presents in detailed anecdotal fashion the pictures he has obtained in a variety of normal and pathologic states.

An introductory chapter called "A Synthesis of the Self Symbol" presents the author's views about the history and philosophy of the brain-mind problem, with particular relationship to the body-image concept. One finds that his recept-percept-concept hierarchy and his frequent switching from brain-behavioral language to mental-psychologic language are both difficult to follow and unrelated to the material presented later. Dr. Cohn seems to believe that the misshapen little man in the sensorimotor homunculus diagrams is a parent (or close relative) of the little people drawn by his subjects.

The techniques of neurologic and electroencephalographic examinations are described in detail. The author also demonstrates that his own judgment of the abnormality of person symbols was largely confirmed in parallel evaluation by several other observers. This reader nevertheless finds some difficulty in clearly defining the criteria of significant asymmetry and deviance in the pictures by studying the illustrations.

The case reports are written in a painfully pedantic fashion; stilted circumlocutions are common:

"On return of propositional awareness within five days after the onset of signs, he was able to speak and indicated that he felt quite well.

"Subsequently, speech was mechanically hesitant and the ideational fluidity did not approximate that observed in the earlier test situation.

"When asked to describe the Washington Monument, he said, 'It's a tall pinnacle, tallest piece of masonry on earth; all I can say is, it is shaped like Cleopatra's needle, only without the designs on it.' He described an elephant as 'loads and loads of blubber, quite round, large, weighing about four and one-half tons, around five tons maybe; four feet, squatty, to support immense weight; has a head, trunk, and a tail. The trunk is used to get food, water, and even to strangle people.' . . . . .

"In contrast to the rapid deterioration of pictorial ability as observed in the preceding case, some patients show a slow but progressive worsening of their ability to generate a person symbol."

Because Dr. Cohn carefully eschews a diagnostic summary, the reader can find no ready escape from toiling through all the detailed case notes.

Almost all of the illustrations consist of a "volitional picture production," matched with the EEG "output" present on the same occasion. The placement of the EEG leads for any recording cannot be determined except by back reference to the electrode array key in an earlier chapter, thus encouraging the reader to ignore the EEG entirely. Perhaps this is fortunate, for one is then spared the implication that the EEG is the most important criterion for comparison with the picture. It would be more useful were the author simply to provide a photograph showing which plantar reflex is extensor, or even a legend summarizing the location and type of each lesion.

It is hardly enlightening to discover that skill in picture drawing is a function of maturation, innate capacity and vision, or that disturbance of brain function may be correlated with less competent performance of this skilled act. As to localized distortions of the picture symbol, there are many examples of malperformance in the half-field

opposite gross cerebral lesions. In addition, there are several examples where perseverative or distorted drawing depicts the part of the body afflicted with pain, motor disability or seizures.

There are no data to demonstrate that the picture symbol is clearly abnormal when there is no other gross evidence of disturbed brain function. Nor is evidence advanced to indicate why a picture of a person is a more useful test than a drawing of a daisy or an elephant.

Having worked his way through 127 case reports, the reader is rewarded with such observations as:

> "The major significance [concerning the sex of drawn figures] derivable is that elements other than the physical and physiological form the basis for picture productions, more so in the female than the male.
>
> "In conclusion the post mortem correlations unequivocally demonstrate that disordered brain function resulting from focal or general structural lesions generate [sic] disordered person symbols. Furthermore these autopsy studies demonstrate equally well that disordered picture drawings occur in brains [sic] that are disturbed in function secondarily to generalized dysmetabolic processes from various etiologies."

In a final paragraph the author concludes:

> "It is obvious from these statistics that picture drawing disturbance is not a pathognomonic sign, and cannot replace the electric and other clinical tests in the diagnosis of the many afflictions of the nervous system; but it is equally evident that the picture drawing should form part of the clinical study of every patient suspected of nervous system lesions."

This reviewer searched diligently but unsuccessfully for evidence supporting the last statement.

The book is well printed, produced and indexed, but is overpriced.

William M. Landau

NEUMANN, ERICH. *The Origin and History of Consciousness* (translation by R. F. C. Hull). Pantheon, Bollingen Series XLII, New York, 1954. xxiv + 493 pp. $5.00

This book takes as its thesis the familiar ontogenetic argument that the organism, as it matures, recapitulates the stages of its historical development. In this case the organism is the ego, and the author suggests that, by studying the history of civilization —more particularly, the history of myths— we can learn about the growth of individual consciousness. As a synthesis of myths from different cultures, and as an attempt to point up some of their common features, the book is an interesting and informed anthology; as a psychologic analysis it is disappointing. We are never convinced that the ontogenetic argument is pertinent or necessary; on the contrary, it has the ring of an unnecessary axiom which only confuses the underlying psychologic phenomena. Jungians might differ with this statement, holding that earlier forms of thinking accumulate in the unconscious, and that the study of mythology therefore provides important clues to its understanding. But lacking evidence for this assumption, the book seems dogmatic and unconvincing.

The key argument is first stated in the Introduction: "In the course of its ontogenetic development, the individual ego consciousness has to pass through the same archetypal stages which determined the evolution of consciousness in the life of humanity. The individual has in his own life to follow the road that humanity has trod before him, leaving traces of its journey in the archetypal sequence of the mythologic images we are now about to examine" (p. xvi). Myths, in short, are laid down as fos-

sils in a clay bank; their sequence can be studied to uncover a sequence of underlying unconscious ideas, which is then repeated in every individual's development.

What are some of these myths? The author lists three main types: the creation myth, the hero myth and the transformation myth. The primary function of the creation myth is to answer the question, "Where did I come from?," and the myths in this category deal with hypotheses about birth, intercourse and conception. For example, an Egyptian myth pictures conception this way: "He found foothold on the earth. When he had found a firm foothold there, he thought 'I will propagate myself.' He emitted heat and became pregnant." The creation myths are grouped under three stages—1) the self-sufficient embryo, 2) the great mother, and 3) the parents—and these stages anticipate the development of the individual. At this juncture the argument runs into difficulties, for the dates of the creation myths do not seem to follow any logical sequence. Stage 1, coming earliest in the life of the individual, should be found in the early myths, and Stages 2 and 3 in the later myths, but the evidence argues otherwise. Stage 1 is found among the Babylonians, the Navahos, the Egyptians and the Mexicans; Stage 2 appears in neolithic pictures in Spain and in people using Sanskrit; and Stage 3 is found among the Maoris and in the pre-Socratic culture of Greece. In short, the more advanced myths can be found among very early civilizations, which argues against a strict historical sequence of development. Without such a sequence, there is no mythologic "phylogeny"; without a phylogeny, there is nothing to recapitulate, and the ontogenetic argument loses its point.

The same difficulties apply to the other myth-types. The birth of the hero, representing the development to manhood, is universally represented in both ancient and modern cultures. And many of the examples of the transformation myth are taken from pre-Socratic Greece.

Throughout the book one has the impression that the ontogenetic argument is primarily a gratuitous encumbrance and detracts from the myths themselves. They tell their own story—a highly varied one which shows man's great symbolic inventiveness, and his ingenuity at answering certain universal problems. They can be studied as a projective screen, following Kardiner, representing a variety of unconscious ideas, much as the patient's productions during analysis can be used to make inferences about his underlying fantasies. To use them to prove a biologic argument seems ill-advised. Because myths are unwritten and cannot be pinpointed in time, they are quite unlike the "hard" evidence of geology, which can be precisely catalogued and dated. The Jungian argument may or may not have its points, but it is not proved by the material in this book.

Donald P. Spence

BRAMMER, LAWRENCE J. AND SHOSTROM, EVERETT L. *Therapeutic Psychology: Fundamentals of Counseling and Psychotherapy.* Prentice-Hall, Englewood Cliffs, New Jersey, 1960. xvii + 447 pp. $6.95

The authors intend this book for the "graduate student who wants a thorough introduction to the field of counseling and psychotherapy," and also for the practitioner who "feels a need for re-examining the fundamental processes of helping human beings grow to maturity."

Speaking as one of the last named, this reviewer can vouch for the fact that re-examination, through the eyes of the authors, of what one may tend to take for granted has been a worthwhile experience.

Speaking from the point of view of the graduate student, this reviewer feels that if he were to read, mark, learn and inwardly

digest all that these pages have to offer, he would have made—insofar as reading alone can achieve it—significant strides toward professional adequacy.

The book is objective and free from polemics. One feels that the authors have no axes to grind, and are clearly well established practitioners in their own specialties (a counseling psychologist in a college setting and a clinical psychologist in private practice). While well versed and steeped in the literature, they do not hesitate to state their own positions, or to make suggestions with an original orientation. They bring to this work balance and poise which are reassuring, and a personal slant which is refreshing.

Psychotherapeutic psychology is envisaged by the authors as "a body of knowledge which gathers its data from a number of related professions all of which embody the 'helping function.' " Clinical psychology, school psychology, social work, pastoral counseling, psychiatry and counseling psychology grow out of and draw from this core material.

Therapeutic psychology is also a body of "understandings, appreciations, and skills common to both processes of counseling and psychotherapy." Counseling is, in the authors' view, characterized essentially by such words as "educational, supportive, situational, problem-solving, conscious awareness, emphasis on 'normals,' and short term," whereas psychotherapy, at the other end of the spectrum, is characterized as "reconstructive, depth emphasis, analytical, focus on the unconscious, emphasis on 'neurotics' or other severe emotional problems, and long term."

The book is divided into three parts. The first is concerned essentially with this core material, the theoretic foundations of therapeutic psychology. The authors feel that practitioners often start too soon to acquire techniques and skills, neglecting the background and academic heritage, and lack the broad understandings of professional sophistication which come from background knowledge. Part I includes a chapter which passes in review many theories and approaches to psychotherapy. Theories are important for the practitioner, the authors feel, because they provide a framework for the making of systematic observations about therapy and counseling, and in the encouraging of the coherence of ideas and in the production of new ideas. Psychoanalytic theory, self-theory, learning-theory and field theory, among others, are discussed. The assumption is that each position has a unique implication for practice, while there is no *one* theory of personality suitable for all facets of therapy and counseling.

The authors themselves formulate a conceptual scheme to represent personality which is analogous to the growth of a tree from sapling to maturity. Personality is viewed, and presented graphically, in terms of concentric circles, the outer defense system constituting a protective block, while successive layers reveal an ego system, a self-system, an inner defense system and, finally, a core of basic and fundamental needs and drives. In a later chapter this concept is used effectively, again with helpful diagrams, to demonstrate what takes place during the actual process of psychotherapy. Again with the utilization of this concept, the *counseling* process is distinguished from the *therapeutic* in that the counselor must refrain from becoming involved with those stages of the total process which include entry into the self-system and penetration into the core system itself. "Many psychological counselors are neither personally nor educationally equipped to deal with the intense feelings and intricate problems of the basic character structure of the personality."

On the thorny question of who does psychotherapy, the authors feel that well-trained psychologists have the undisputed right to draw from their own basic discipline of therapeutic psychology and to engage in the function of "helping the human

being grow to maturity." They feel that "there are logical and practical reasons for sharing psychotherapeutic responsibility." The answer (as to who shall do therapy rather than counseling) lies in making "carefully defined distinctions of the criteria of depth of therapy, the amount of training, experience, responsibility, and the institutional setting," etc. At the same time, they warn that "counselors and psychotherapists cannot escape the reality of the societal concept of medical responsibility . . . the physician has legal responsibility for care having life and death implications for the individual."

The final chapter of Part I concerns the development of personality. It draws heavily from those authors whose work has dealt with stages of development, and is useful in reminding the practitioner of those problems his client presents which rightly belong to his actual stage of development, as opposed to those which characterize an earlier stage and from which he has not yet emerged.

Part II is concerned with techniques, the actual tools of the therapeutic trade. These techniques are considered under the chapter headings of Relationship Techniques; Special Relationship Problems (transference, countertransference, resistance); Interpretation Techniques; Use of Advice, Information, and Tests; Group Dynamics, Multiple Counseling, and Group Psychotherapy; and the use of material from the test findings and counseling sessions. The authors also formulate and describe a new technique which they have named "Reflectation." This involves "a mixture of reflection and interpretative techniques in varying degrees." In using reflectation, the counselor adds strong cognitant elements to his reflection of feelings, giving a forward movement to the therapeutic process in that reflectation verbalizes material the client may have felt only vaguely.

In Part III the authors consider the therapeutic psychologist at work in the specific areas of marriage counseling, counseling of children and parents, in educational, vocational and rehabilitation counseling, and the counseling in industry and government. In this stage of specialization, few of us cover all of these fields in active practice. Each chapter achieves a satisfactory and authentic blend of practical experience and academic thoroughness in the handling of these specialties.

The authors take a stand in regard to nondirective therapy, namely: "We greatly respect Rogers' contribution but we are quite at variance with his basic theoretical position." They also take a stand about allowing to the counselor or therapist freedom in expression about his feelings and values. "A counseling relationship which does not allow the expression of the counselor's feelings puts him in a form of emotional straight [sic] jacket which may be harmful to the relationship." They remark, in regard to the therapist's sometimes letting his own values be known to the client, "It is pure sophistry to presume that in the deeply human relationship of counseling the counselor does not influence the client's values." In a similar way they espouse the view that "having a satisfying philosophy of life appears to build self-system strength, and to make more possible the goals of mature growth."

The book reads easily. One of its pleasant features, as mentioned earlier, is the use of diagrams to clarify discussions. Another helpful device is the routine use of concrete examples throughout the text. Too many writers seem to feel that the reader's intellect will be insulted if the text becomes too specific. (A work with ample illustrations illuminates the fact that the reader is often too lazy to formulate his own examples, or may well formulate them erroneously and have no way of checking the accuracy of his interpretation.) The volume has an extensive bibliography (over 300 titles).

Although the general impression is most favorable, a few minor criticisms may be